



Room thermostats with KNX communications RDG100KN, RDG160KN

Basic Documentation

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1. About this document

1.1 Revision history

Edition	Date	Changes	Section	Pages
3.2	March 2014	• 2-position → On/Off (only partially) • Update Equipment Combination • Protection via circuit breaker • Add eu.bac certification • Update section Standards and Directives • Update C-tick	Various 2.4 4.1, 6.2, 8 8 8 8	
3.1	Sept 2013	• DC 0...10 V actuators • Various corrections	2.4 various	
3.1	March 2013	• Various corrections	various	
3.0	January 2013	• Amendments for RDG160KN • Various corrections	various	
2.0	June 2011	• Amendments for new Software V1.20 • Various corrections	various	
1.0	07 Jun 2010	First edition		

1.2 Reference documents

Subject	Ref	Doc No.	Description
Room thermostats with KNX communications, RDG100KN	[1]	CE1N3191	Data Sheet
	[2]	CE1B3191	Operating Instructions
	[3]	CE1M3191	Mounting Instructions
KNX Manual	[4]	Handbook for Home and Building Control – Basic Principles http://www.knx.org/knx-en/training/books-documentation/knx-association-books/index.php	
Synco and KNX (see www.siemens.com/synco)	[5]	CE1N3127	KNX bus, Data Sheet
	[6]	CE1P3127	Communication via the KNX bus for Synco 700, 900 and RXB/RXL, Basic Documentation
	[7]	XLS template	Planning and commissioning protocol, in HIT communication Synco 700
	[8]	CE1N3121	RMB395 central control unit, Data Sheet
	[9]	CE1Y3110	KNX S-mode data points
	[10]	--	Product data for ETS
	[11]	CE1J3110	ETS product data compatibility list
	[12]	0-92168en	Synco Application Manual
Desigo engineering documents	[13]	CM1Y9775	Desigo RXB integration – S-mode
	[14]	CM1Y9776	Desigo RXB / RXL integration – Individual Addressing
	[15]	CM1Y9777	Third-party integration
	[16]	CM1Y9778	Synco integration
	[17]	CM1Y9779	Working with ETS

1.3 Before you start

1.3.1 Copyright

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1.4 Target audience, prerequisites

This document assumes that users of the RDG KNX thermostats are familiar with the ETS and/or Synco ACS tools and able to use them.

It also presupposes that these users are aware of the specific conditions associated with KNX.

In most countries, specific KNX know-how is conveyed through training centers certified by the KNX Association (see www.knx.org/).

For reference documentation, see section 1.2.

1.5 Glossary

The inputs, outputs and parameters of an application can be influenced in various ways. These are identified by the following symbols in this document:



ETS

Parameters identified by this symbol are set using ETS.



ACS

Parameters identified by this symbol are set using the ACS tool.



Note!

Setting RDG KNX parameters is only supported by the following tool versions:

- ETS3f or higher
- ACS version 5.11 or higher



Inputs and outputs identified by this symbol communicate with other KNX devices. They are called communication objects (CO).

The communication objects of the RDG KNX thermostats work partly in S-mode, partly in LTE mode, and partly in both. These objects are described accordingly.

A list of the parameters is shown in section 3.12.

2. Summary

2.1 Types

Product no.	Stock no.	Features							
		Operating voltage	Number of control outputs				Fan		Backlit LCD
			On/Off	PWM	3-pos.	DC	3-speed	DC	
RDG100KN	S55770-T163	AC 230 V	3 ¹⁾	2 ¹⁾	2 ¹⁾		✓		✓
RDG160KN	S55770-T297	AC 24 V	2 ²⁾			2 ²⁾		✓	✓
						2	✓ ³⁾		

1) Selectable: On/Off, PWM or 3-position (triac outputs)

2) Either On/Off or DC control signal

3) 3-speed fan selectable only with DC outputs

2.2 Functions

Use

Fan coil units via On/Off or modulating / DC control outputs:

- 2-pipe system
- 2-pipe system with electric heater
- 2-pipe system and radiator / floor heating
- 4-pipe system
- 4-pipe system with electric heater (RDG100KN)
- 2-stage heating or cooling system

Chilled / heated ceilings (or radiators) via On/Off or modulating / DC control outputs:

- Chilled / heated ceiling
- Chilled / heated ceiling with electric heater
- Chilled / heated ceiling and radiator / floor heating
- Chilled ceiling and radiator / floor heating
- Chilled / heated ceiling, 2-stage cooling or heating

Compressor application via On/Off control outputs (RDG160KN)

- Heating or cooling, compressors in DX-type equipment
- Heating or cooling, compressors in DX-type equipment with electric heater
- Heating AND cooling, compressors in DX-type equipment
- 2-stage heating or cooling, compressors in DX-type equipment

The room thermostats are delivered with a fixed set of applications.

The relevant application is selected and activated during commissioning using one of the following tools:

- Synco ACS
- ETS
- Local DIP switch and HMI

Features

- Operating modes: Comfort, Economy and Protection
- Automatic or manual heating / cooling changeover
- Backlit display

RDG100KN:

- On/Off, PWM or 3-position control outputs (triac)
- Output for 3-speed or 1-speed fan
- AC 230 V operating voltage

RDG160KN:

- DC 0...10 V or On/Off control outputs for actuators
- DC 0...10 V or relay outputs for fan (ECM or 1 / 3 speed)
- AC 24 V operating voltage

Functions

- Room temperature control via built-in temperature sensor or external room temperature / return air temperature sensor
- Changeover between heating and cooling mode (automatic via local sensor or bus, or manually)
- Selection of applications via DIP switches or commissioning tool (ACS, ETS).
- Parameters download with commissioning tool (ACS, ETS)
- Select operating mode via operating mode button on the thermostat
- Temporary Comfort mode extension
- 1- or 3-speed, or DC 0...10 V fan control (automatically or manually)
- Display of current room temperature or setpoint in °C and/or °F
- Minimum and maximum limitation of room temperature setpoint
- Button lock (automatically or manually)
- 3 multifunctional inputs, freely selectable for:
 - Operating mode switchover contact (keycard, window contact, etc.)
 - Sensor for automatic heating / cooling changeover
 - External room temperature or return air temperature sensor
 - Dew point sensor
 - Electric heater enable
 - Fault input
 - Monitor input for temperature sensor or switch state
 - Supply air temperature sensor (RDG160KN)
- Advanced fan control function, e.g. fan kick, fan start delay, selectable fan operation (enable, disable or depending on heating or cooling mode)
- "Purge" function together with 2-port valve in a 2-pipe changeover system
- Reminder to clean fan filters (adjustable with P62)
- Floor heating temperature limitation
- Minimum and maximum supply air temperature limitation (RDG160KN)
- Reload factory settings for commissioning and control parameters
- KNX bus (terminals CE+ and CE-) for communication with Synco or KNX compatible devices
- Display of outside temperature or time of day via KNX bus
- Time scheduling and central control of setpoints via KNX bus
- With a Synco RMB795 controller, the energy demand signal of the thermostat is used to optimize energy supply
- Selectable relay function for switching external equipment (RDG160KN)

2.3 Integration via KNX bus

The RDG room thermostats can be integrated as follows:

- Integration into Synco 700 system via LTE mode (easy engineering)
- Integration into Synco living via group addressing (ETS)
- Integration into Desigo via group addressing (ETS) or individual addressing
- Integration into third-party systems via group addressing (ETS)

The following KNX functions are available:

- Central time program and setpoints, e.g. when using the RMB795 central control unit
- Outside temperature or time of day via bus displayed on thermostat
- Remote operation and monitoring, e.g. using the RMZ792 bus operator unit
- Remote operation and monitoring with web browser using the OZW772 web server
- Maximum energy efficiency due to exchange of relevant energy information, e.g. with Synco 700 controllers (e.g. heating demand, cooling demand)
- Alarming, e.g. external fault contact, condensation, clean filter, etc.
- Monitoring input for temperature sensor or switch

Engineering and commissioning can be done using...

- local DIP switches / HMI
- Synco ACS
- ETS

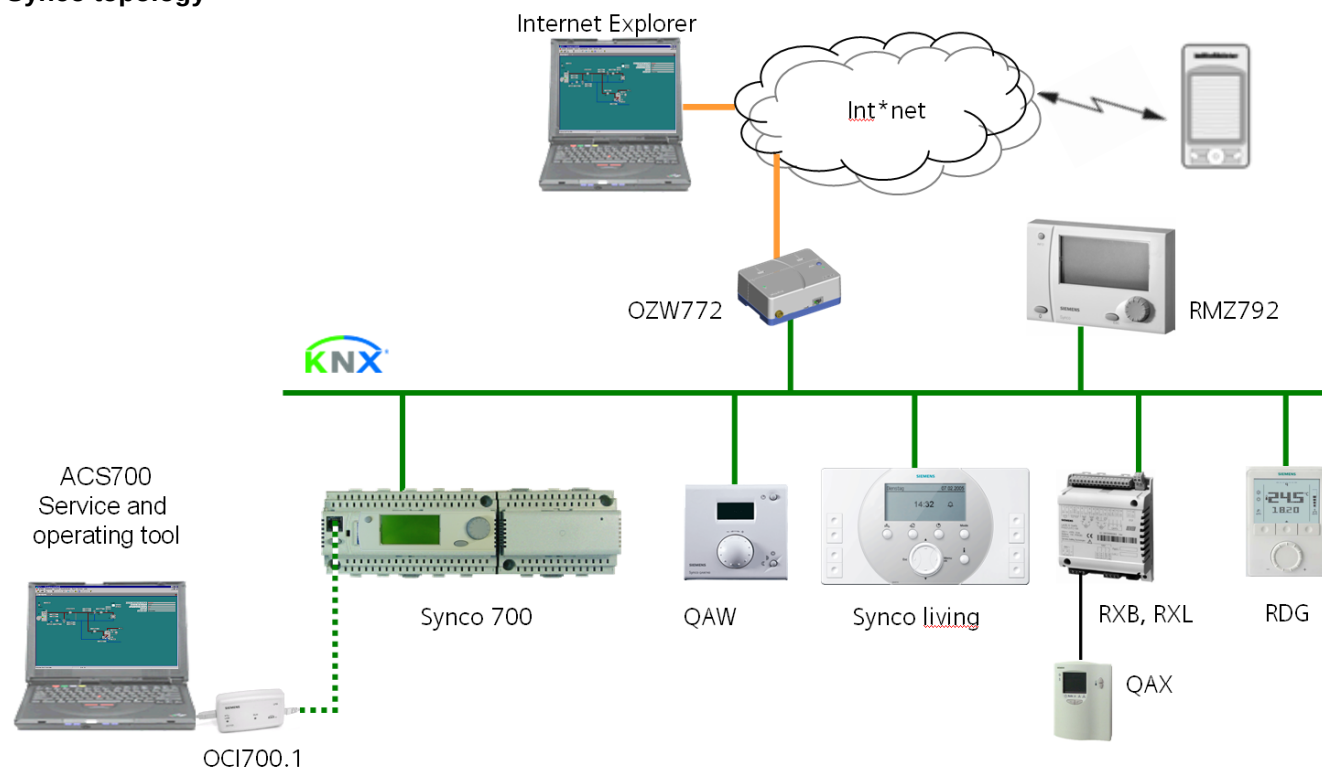
Synco 700

The RDG room thermostats are especially tailored for integration into the Synco 700 system and operate together in LTE mode. This extends the field of use of Synco for individual room control in conjunction with fan coil units, VAV, chilled ceilings and radiators.

Synco living

Thanks to S-mode extension to the QAX9x3 central apartment unit, communicating room thermostats can be easily integrated into Synco living systems. Using the S-mode data points of the central apartment unit, additional room information can be exchanged with the room thermostat via KNX TP1 (RF function is not available on the room thermostats). To make the integration, the ETS engineering tool is required.

Synco topology



Legend:	Synco 700	Building automation and control system (BACS)
	Synco living	Room automation and control system
	RDG..., RDF..., RDU...	Room thermostats
	OZW772	Web server
	RMZ792	Bus operator unit
	QAW...	Room unit
	ACS	Service tool using OCI700.1 (OCI700.1 is delivered with a service cable which can be plugged into the service connector on a Synco controller)
	RXB, RXL	Room controllers
	QAX	Room unit for RXB / RXL room controllers

Designo and third-party systems

The RDG KNX devices can be integrated into the Siemens building automation and control systems (BACS) Designo / Apogee or into 3rd-party systems. For integration, either S-mode (group addressing) or individual addressing can be used.

2.4 Equipment combinations

Description		Product no.	Data sheet
On / off actuators	Cable temperature or changeover sensor 	QAH11.1	1840
	Room temperature sensor 	QAA32	1747
	Condensation motion 	QXA2601 / QXA2602 / QXA2603 / QXA2604	3302
	Electromotoric On/Off actuator 	SFA21...	4863
On/Off and PWM actuators *)	Electromotoric On/Off valve and actuator (only available in AP, UAE, SA and IN) 	MVI... / MXI...	4867
	Zone valve actuator (only available in AP, UAE, SA and IN) 	SUA...	4832
	Thermal actuator (for radiator valves) AC 230 V, NO 	STA23... *)	4884 *)
	Thermal actuator (for radiator valves) AC 24 V, NO 	STA73... *)	4884 *)
3-position actuators	Thermal actuator AC 230 V (for small valves 2.5 mm), NC 	STP23... *)	4884 *)
	Thermal actuator AC 24 V (for small valves 2.5 mm), NC 	STP73... *)	4884 *)
	Electrical actuator, 3-position (for radiator valves) 	SSA31...	4893
	Electrical actuator, 3-position (for 2- and 3-port valves / V...P45) 	SSC31	4895
DC 0...10 V actuators	Electrical actuator, 3-position (for small valves 2.5 mm) 	SSP31...	4864
	Electrical actuator, 3-position (for small valves 5.5 mm) 	SSB31...	4891
	Electrical actuator, 3-position (for small valve 5 mm) 	SSD31...	4861
	Electromotoric actuator, 3-position (for valves 5.5 mm) 	SQS35...	4573
	Electrical actuator, DC 0...10 V (for radiator valves) 	SSA61...	4893
	Electrical actuator, DC 0...10 V (for 2- and 3-port valves / V...P45) 	SSC61...	4895
	Electrical actuator, DC 0...10 V (for small valves 2.5 mm) 	SSP61...	4864
	Electrical actuator, DC 0...10 V (for small valves 5.5 mm) 	SSB61...	4891
	Electrical actuator, DC 0...10 V (for CombiValves VPI45) 	SSD61...	4861

Electromotoric actuator, DC 0...10 V (for valves 5.5 mm)		SQS65...	4573
Electrothermal actuator, AC 24 V, NC, DC 0...10 V, 1 m		STA63	4884
Electrothermal actuator, AC 24 V, NO, DC 0...10 V, 1 m		STP63	4884

- *) Note: With PWM control, it is not possible to ensure exact parallel running of 2 or more thermal actuators.
If several fan coil systems are controlled by the same room thermostat, preference should be given to motorized actuators with On/Off or 3-position control

Note: For the parallel operation of the actuators, refer to information in the data sheets of the selected actuators and to this list, depending on which value is lower:

Maximum number of actuators in parallel on the RDG100KN

- max 6 SS...31... actuators (3-pos)
- max 4 ST...23.. if used with On/Off control signal
- max 10 SFA., SUA., MVI., MXI.. On/Off actuators
- Parallel operation of SQS35 is NOT possible

Maximum number of actuators in parallel on the RDG160KN

- max 10 SS...61.. actuators (DC)
- max 10 ST..23/63/73... actuators (DC or On/Off)
- max 10 SFA., SUA., MVI., MXI ... On/Off actuators
- max 10 SQS65 actuators (DC)

2.5 Accessories

Description	Product no / Stock no.	Data sheet
KNX power supply 160 mA (Siemens BT LV)	5WG1 125-1AB02	--
KNX power supply 320 mA (Siemens BT LV)	5WG1 125-1AB12	--
KNX power supply 640 mA (Siemens BT LV)	5WG1 125-1AB22	--

3. Functions

3.1 Temperature control

General note: Parameters

Setting of the control parameters (P01, etc., mentioned throughout the document) is described in section 3.14.

Temperature control

The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1), and maintains the setpoint by delivering actuator control commands to heating and/or cooling equipment. The following control outputs are available:

- On/Off control (2-position)
- Modulating PI/P control with PWM output
- Modulating PI/P control with 3-position control output
- Modulating PI/P control with DC 0...10 V control output

The switching differential or proportional band is 2 K for heating mode and 1 K for cooling mode (adjustable via parameters P30 and P31).

The integral action time for modulating PI control is adjustable via parameter P35 (factory setting 5 min on RDG100KN / 45 min on RDG160KN).

Display

The display shows the acquired room temperature or the Comfort setpoint, selectable via parameter P06. The factory setting displays the current room temperature. Use parameter P04 to display the room temperature or setpoint in °F rather than °C as needed.

The acquired room temperature (internal or external sensor) is also available as information on the bus.



Room temperature



- With automatic changeover or continuous heating / cooling, symbols / indicate that the system currently heats or cools (heating or cooling output is activated).
- With manual changeover (P01 = 2), symbols / indicate that the system currently operates in heating or cooling mode. Thus, the symbols are displayed even when the thermostat operates in the neutral zone. Symbols ◀ / ◀ indicate that the system currently heats or cools (heating or cooling output is activated).

Concurrent display of
°C and °F

Concurrent display of the current temperature or setpoint in °C and °F (parameter P07 = 1) is possible on the thermostats.



Outside temperature via
bus

The outside temperature can be displayed on the room thermostat by setting parameter P07 = 2. This temperature value has only information character. In LTE mode, the outside temperature can only be received on outside temperature zone 31. *RDG100KN SW version < 1.20: outside temperature zone 1.* In S-mode, the corresponding communication object needs to be bound with a KNX sensor device.



Time of day via bus

Time of day via bus can be displayed on the room thermostat by setting parameter P07 = 3 or 4. The display format is either in 12- or in 24-hour format. The information can be received from a Synco controller with time master functionality or any other KNX device if the corresponding communication object is bound.

Note When an application program is downloaded to the Synco devices via ETS, the correct group addresses need to be downloaded as well, in order to display the time of day on the room thermostat (see Synco Knowledge Base - KB771).

3.2 Operating modes

The thermostat's operating mode can be influenced in different ways (see below). Specific heating and cooling setpoints are assigned to each operating mode.

The thermostat sends the effective room operating mode on the bus.

The following operating modes are available:



Room operating mode:
State

Auto Timer



In Auto Timer mode the room operating mode is commanded via bus. Auto Timer is replaced by Comfort when no time schedule via bus is present

Comfort



In Comfort mode, the thermostat maintains the Comfort setpoint. This setpoint can be defined via parameters P8, P9 and P10. It can be locally adjusted via the rotary knob or via bus. In Comfort mode, the fan can be set to automatic or manual fan speed: Low, medium or high.

Economy



The setpoints (less heating and cooling than in Comfort mode) can be defined via parameters P11 and P12.

The thermostat switches to Economy mode when...

- the operating mode button is pressed (only possible if parameter P02 is set to 2)
 - Economy is sent via bus
 - an operating mode switchover contact (e.g. keycard contact presence detector, window contact) is active
- The contact can be connected to digital input D1 or multifunctional input X1, X2 Set parameter P38 / P40 / P42 to 3 (P02 is irrelevant) *)
- "Window state" is sent via bus, e.g. from a KNX switch or a KNX presence detector (P02 is irrelevant) *)



Room operating mode:
Window state

Note: *) Operating mode switchover: *Only one input source must be used, either local input X1/X2/D1 or KNX bus.*
User operations are ineffective and "OFF" is displayed if the operating mode switchover contact is active, or if "Window state" is sent via bus.

Protection



In Protection mode, the system is...

- protected against frost (factory setting 8 °C, can be disabled or changed via P65)
- protected against overheating (factory setting OFF, can be enabled or changed via P66)

No other operating mode can be selected locally if Protection mode is commanded from time schedule via bus (e.g. from RMB795).  and  are displayed.

3.2.1 Different ways to influence the operating mode

Source for change of operating mode



ACS

The operating mode can be influenced by different interventions.

The source of the effective room operating mode state can be monitored using the "Cause" diagnostic data point in the ACS tool, operator unit RMZ792 or web server OZW772 / 775.

Source	Description	Value of DP "Cause"
Local operation via left button	- Operating mode is not Auto Timer - No time schedule via bus	Room operating mode selector (preselection)
	Temporary Comfort extension is active	"Timer" function
	Operating mode switchover contact	Room operating mode contact
Bus command Room op. mode	"Window state" sent via bus	Room operating mode contact
	- Time schedule available via bus → local operating mode is set to Auto Timer - Time schedule sends Protection mode via bus → operating mode cannot be changed locally	Time switch

Priority of operating mode interventions

The following table shows the priorities of different interventions.
A lower number means a higher priority.

Priority	Description	Remark
①	Commissioning	In parameter setting mode (highest priority), you can always command an operating mode independent of all other settings or intervention via bus and local input.
②	Protection mode via bus from time schedule	Protection mode, sent by a time schedule, has priority 2. It cannot be overridden by the user nor by an operating mode switchover contact.
③	Operating mode switchover contact	If the contact is closed, the operating mode changes to Economy. This overrides the operating mode on the thermostat.
③	"Window state" via bus	"Window state" sent via bus has the same effect as the operating mode switchover contact.
		<i>Note: Only one input source must be used, either local input X1/X2/D1 or KNX bus.</i>
④	Operating mode button	The user can switch the operating mode using the operating mode button.
④	Operating mode via bus	The operating mode can be changed via bus
④	Temporary extended Comfort mode via operating mode button	The operating mode can be temporarily set from Economy to Comfort by pressing the operating mode button, if... - Economy was sent via bus - extended Comfort period >0 (parameter P68)
		<i>The last intervention wins, either locally or via bus</i>
④	Time schedule via bus	The operating mode sent via bus can be overridden by all other interventions. <i>Exception: Protection mode has priority 2.</i>

Auto Timer mode with time schedule via bus



If a time schedule via bus is present, e.g. from central control unit, then the Auto Timer mode  is active. The thermostat automatically changes between Comfort and Economy according to the time schedule via bus.

The display shows the Auto Timer mode symbol  along with the symbol for the effective room operating mode (Comfort  or Economy ).

By pressing the operating mode button, you can change to another operating mode.

Automatic fan is the default fan speed in Auto Timer mode.

Behavior when bus sends new operating mode

Each time the time schedule sends a new operating mode (switching event), the operating mode of the thermostat is set back to Auto Timer mode. This is to assure that the room temperature is maintained according to the time schedule.

Precomfort via bus

If the time schedule sends Precomfort mode, then this mode will be transformed either into Economy (factory setting) or Comfort (selectable via parameter P88).

Behavior when bus sends Protection

No intervention is possible neither by the user nor by an operating mode switch-over contact, if Protection mode is set by the time schedule. OFF flashes on the display when the user presses a button.

Availability of Economy mode

The operating mode can be selected locally via the operating mode button. The behavior of the operating mode button (user profile) can be defined via parameter P02, factory setting is P02 = 1.

P02	Without time schedule	With time schedule via bus	Description
1	 → 	 → 	- Switching manually between 2 modes, Economy is not available (factory setting) - Suited for hotel guest rooms or commercial buildings. - If a time schedule via bus is available, then the Comfort mode can be temporarily extended (see below)
2	 →  → 	 →  →  → 	- Switching manually between 3 modes - Suited for homes and rooms where manual switching to Economy mode is desired

Operating mode switchover contact (window contact)



Room operating mode:
Window state

The thermostat can be forced into Economy mode (e.g. when a window is opened, when a presence detector signals "no one present", when the keycard of a hotel room is withdrawn, etc). The contact can be connected to digital input D1 (or multi-functional input X1, X2). Set parameter P42 (P38, P40) to 3.

The function is also available via the KNX signal "Window state", e.g. from a KNX switch or a KNX presence detector.

Note: Only one input source must be used, either local input X1/X2/D1 or KNX bus. User operations are ineffective and "OFF" is displayed if the operating mode switchover contact is active, or if "Window state" is sent via bus.

Temporary timer to extend the Comfort mode

Comfort mode can be temporarily extended (e.g. working after business hour or on weekends) when the thermostat is in Economy mode. The operating mode button switches the operating mode back to Comfort for the period preset in P68. Press the operating mode button again to stop the timer.

The following conditions must be fulfilled:

- The operating mode switchover contact is closed (connected to input X1, X2, D1, parameter P38, P40, P42 set to 3 or a KNX switch, KNX presence detector, etc. via bus)
or
mode selection via operating mode button is set to "Protection-Auto" (P02 = 1) and the time schedule via bus is Economy
- Parameter P68 (extend Comfort period) is greater than 0

During the temporary Comfort mode extension, symbol  appears.

If parameter P68 (extend Comfort period) = 0, extended Comfort cannot be activated; pressing the left button will switch the thermostat to Protection.

If the operating mode switchover contact is active, pressing the left button will show "OFF" (blinking).

Timer for extension of presence / absence

The effective room operating mode can be forced temporarily into Comfort or Economy / Protection mode. The time period is adjusted via the rotary knob:

- Extend presence: Set the device to Comfort mode for the selected time period
- Extend absence: Set the device to Economy / Protection mode for the selected time period

To activate the function, keep the left button pressed and, within 3 seconds, turn the rotary knob...

- clockwise for extended presence
- counterclockwise for extended absence

The rotary knob adjusts the time period:

- Extend presence: 0:00...+9:30 in steps of 30 minutes; symbol  appears
- Extend absence: 0:00...-9:30 in steps of 30 minutes; symbol  or  appears

During the extended presence / absence period, the sandglass symbol  appears.

Function if no time schedule is received via bus

User profile for operating mode (selected via P02)	Operating mode when activating function	Function	Operating mode during function	Operating mode at the end of function
P02 = 1:  	Comfort	Extension	Comfort	Protection
	Comfort	Absence	Protection	Comfort
P02 = 2:   	Comfort or Economy	Extension	Comfort	Economy
	Comfort or Economy	Absence	Economy	Comfort

Note Extension / Absence functions not available in protection mode

Function with time schedule via bus

User profile for operating mode (selected via P02)	Operating mode when activating function	Function	Operating mode during function	Operating mode at the end of function
P02 = 1:   	Auto or comfort	Extension	Comfort	Auto
	Auto or comfort	Absence	Protection	Auto
P02 = 2 →    	Auto, Comfort or Economy	Extension	Comfort	Auto
	Auto, Comfort or Economy	Absence	Economy	Auto

Note Extension / Absence functions are not available in protection mode

3.2.2 Communication examples

The following examples show two typical applications of a central time schedule in conjunction with local control of the room operating mode.

The room operating mode in rooms 1...2 of a building is determined by the time schedule. Window contacts are fitted in all rooms.

The following conditions are specified:

The rooms are used and controlled by the time schedule as follows:

- Night setback from 17:00 to 08:00 (Economy)
- Protection from 20:00 to 06:00
- Lunch break from 12:00 to 13:00 (Precomfort)

The substitution (parameter P88) for Precomfort via bus is set on the thermostats as follows:

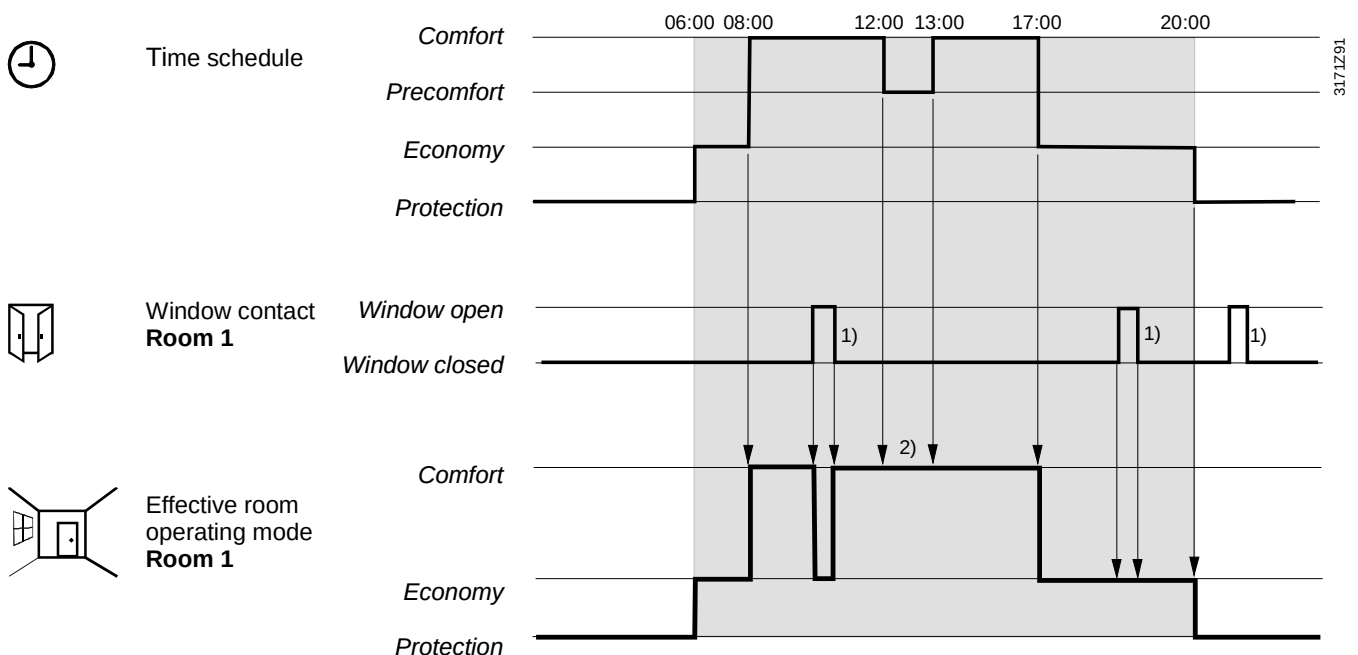
- Room 1: Comfort (1)
- Room 2: Economy (0)

Example 1

Operating mode switchover

In **room 1**, the window is opened briefly, once in the morning, once in late afternoon and once at night (1). Only the opening in the morning has a direct impact on the effective room operating mode.

During lunch break, the time schedule changes to Precomfort. The mode remains in Comfort as set by parameter "Transformation Precomfort" (P88 = 1).



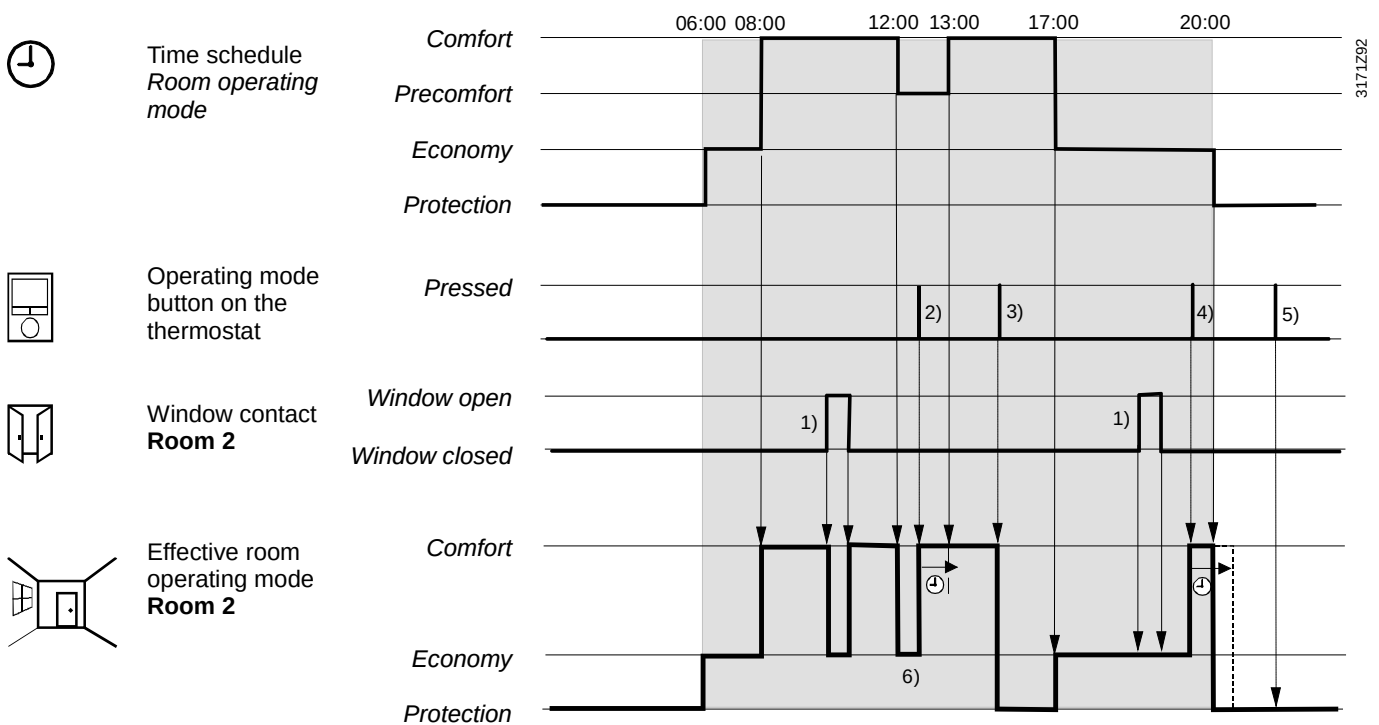
Example 2

Interaction of user operation (operating mode button) and central time schedule

In **room 2**, the window is opened briefly, once in the morning and once at night (1). Only the opening in the morning has a direct impact on the effective room operating mode.

With the operating mode button, the operating mode can be changed between OFF and Auto or temporary Comfort extension respectively.

- During lunch break, the time schedule changes to Precomfort. The mode of the thermostat changes to Economy as set by parameter "Transformation Precomfort" (P88 = 0) (6).
- During lunch break, the user changes the operating mode to Comfort (temporary Comfort extension) by pressing the operating mode button (2). At 13:00, the timer is reset due to mode change of the central time schedule.
- In the afternoon, the user switches the thermostat off by pressing the operating mode button (3). At 17:00 the user setting is reset to Economy by the time schedule.
- At 19:30, the user again extends the Comfort mode (4). At 20:00, the timer is reset by the time schedule.
- After 20:00, pressing the operating mode button has no effect, as the central time switch sets the thermostat to Protection (5).



3.3 Room temperature setpoints

3.3.1 Description

Comfort mode



The factory setting for the Comfort basic setpoint is **21 °C** and can be changed in the thermostat's EEPROM via parameter P08 or via bus with communication object "Comfort basic setpoint". The last intervention always wins.

The Comfort setpoint can be adjusted via the rotary knob, or via bus from a remote device like a touchpanel, operating unit, etc. The last intervention always wins.

Temporary setpoint

If the "Temporary setpoint" function is enabled via parameter P69, the Comfort setpoint adjusted via the rotary knob, or via bus is set back to the Comfort basic setpoint stored in P08 when the operating mode changes.

This setback is only executed when the change of the operating mode was commanded by pressing the mode button on the device or via bus. Setback is not executed when the change of the operating mode was caused by the window contact (digital input or bus).

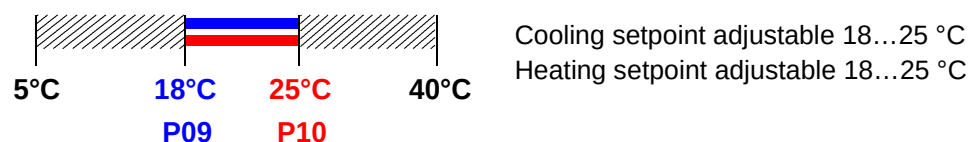
Setpoint limitation

For comfort or energy saving purposes, the setpoint setting range can be limited to minimum (P09) and maximum (P10).

P09 < P10 (comfort concept)

- If the minimum limit **P09 is set lower** than the maximum limit P10, both heating and cooling are adjustable between these 2 limits.
- The customer adjusts the desired setpoint and the thermostat controls the room temperature accordingly.
- For 4-pipe applications *), the selected comfort setpoint is in the middle of the dead zone (P33). The unit stops to energize the heating / cooling outputs as soon as the room temperature reaches the dead zone.

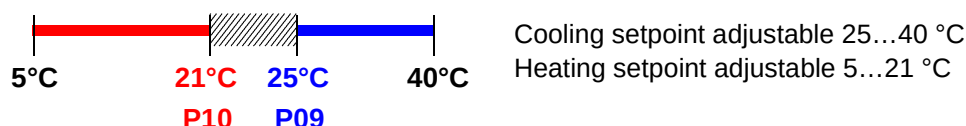
Example



P09 ≥ P10 (energy saving concept)

- If the minimum limit **P09 is set higher** than the limit P10, then
 - The setting range of cooling setpoint is from **P09...40 °C** in place of 5...40 °C
 - The setting range of heating setpoint is from **5...P10 °C** in place of 5...40 °C. This allows the user to limit the maximum heating setpoint and the minimum cooling setpoint. This concept helps to save energy costs.
- For 4-pipe applications *):
 - The thermostat runs with the setpoint of the active sequence:
 - In heating mode, the heating setpoint is active and adjustable via rotary knob.
 - In cooling mode, the cooling setpoint is active and adjustable via rotary knob.
 - Switching from the heating setpoint to the cooling setpoint and vice-versa occurs when the room temperature reaches the adjusted limitation (P09 or P10) of the **inactive** sequence. E.g. the thermostat is in heating sequence and runs with the heating setpoint. When the room temperature reaches P09, the thermostat switches to cooling mode and runs with the cooling setpoint, as long as the room temperature does not drop below P10.

Example



***) Note: SW < V1.20**

For heating **and** cooling applications (e.g. 4-pipe):

- **P09** is the setpoint for cooling and **P10** the setpoint for heating
- The setpoint can not be adjusted via the rotary knob

Economy mode



Use control parameters P11 and P12 to adjust the Economy mode setpoints.
The heating setpoint is factory-set to **15 °C**, and the cooling setpoint to **30 °C**.

Protection mode



Use control parameters P65 and P66 to adjust the Protection mode setpoints.
The heating setpoint is factory-set to **8 °C** (frost protection) and to **OFF** for cooling.

Caution

If a setpoint (Economy or Protection) is set to OFF, the thermostat does not control the room temperature in the corresponding mode (heating or cooling).
This means no protective heating or cooling function and thus risk of frost in heating mode or risk of overtemperature in cooling mode!
The Economy setpoints are accessible at the service level (P11, P12); the Protection setpoints at the expert level (P65, P66).

3.3.2 Setting and adjusting setpoints

Room temperature setpoints can be

- set during commissioning
- adjusted during runtime



Comfort basic setpoint Comfort setpoint

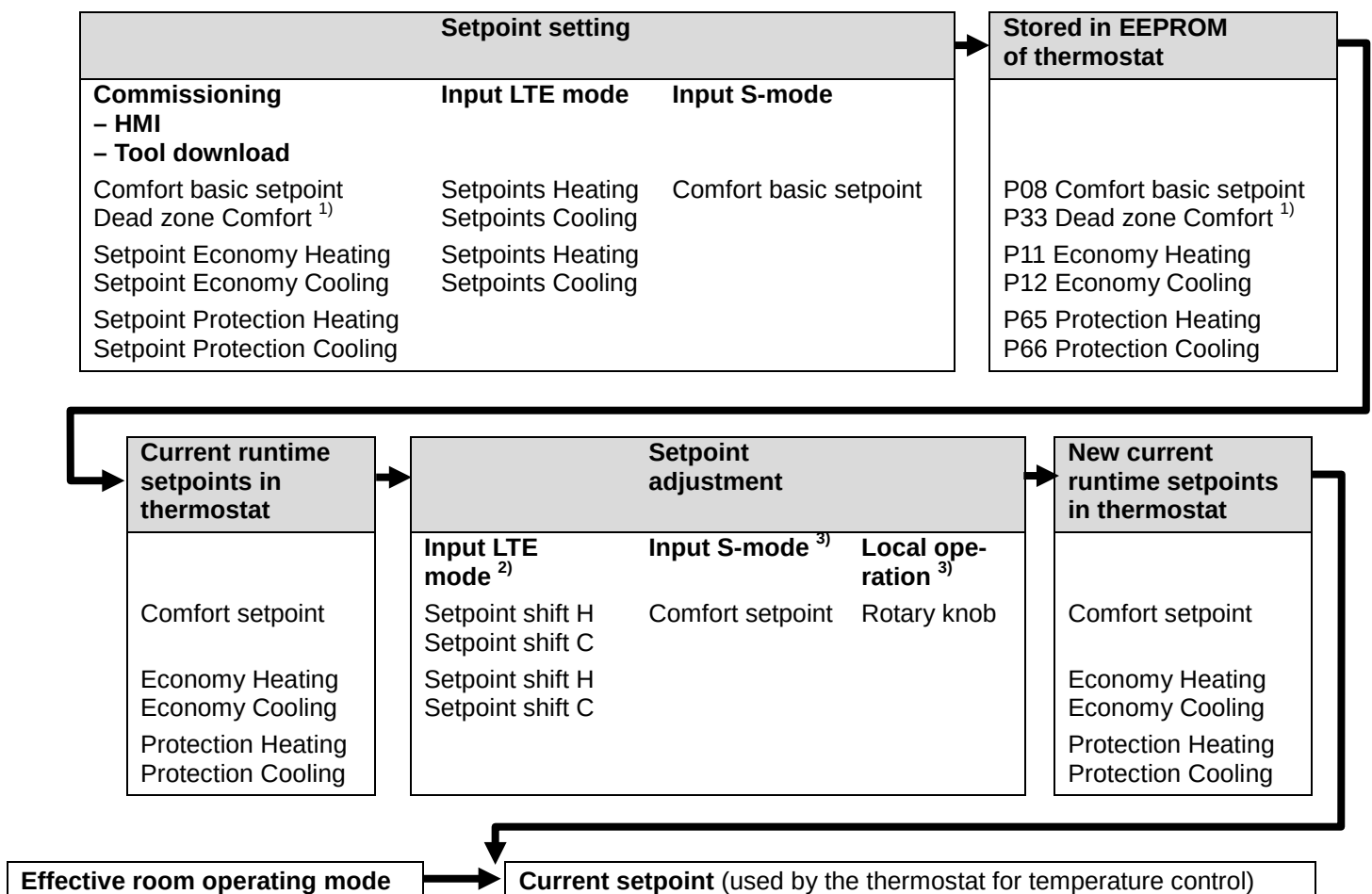
The source can be

- the local HMI
- a tool
- a central control unit

The thermostat stores the setpoints

- in EEPROM in the form of parameters
- in the runtime memory

The table below shows the interrelations:



1) Only required for heating AND cooling applications (see section 3.6.11)

2) LTE mode: **the shift is added** to the local shift

3) S-Mode: **the last intervention wins**, either S-Mode input or local operation



Current setpoint

The current setpoint (used by the thermostat for temperature control) is available on the bus for use in the central control unit.

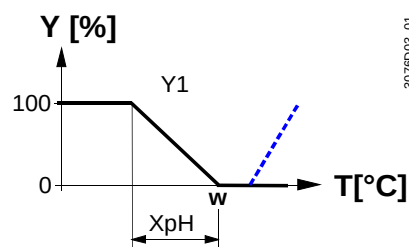
Clarification concerning current setpoint in Comfort mode

2-pipe or
4-pipe with P09>P10

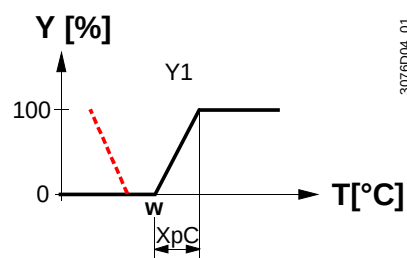
The **comfort setpoint w** (e.g. customer setting on the display) and the **current setpoint w2** (used by the thermostat for temperature control, but not visible on the unit) is handled differently depending of the selected application and setting:

The **comfort setpoint w** and **current setpoint w2** have the same value

Heating mode



Cooling mode

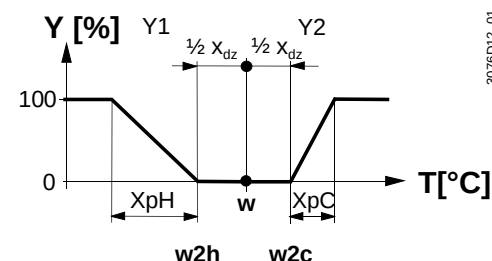


4-pipewith P09<P10

The **comfort setpoint w** (value selectable via e.g. rotary knob) is in the middle of the dead zone (P33). The **current setpoints w2..** (used by the thermostat for temperature control) are at the boundaries of the dead zone.

$w2h = \text{Comfort setpoint (w)} - \frac{1}{2} \text{ dead zone (Xdz)}$

$w2c = \text{Comfort setpoint (w)} + \frac{1}{2} \text{ dead zone (Xdz)}$



General notes:

- The supported communication objects are different in LTE mode and S-mode.
- Changes via the local HMI or via tool have the same priority (last always wins).
- Setting the Comfort basic setpoint will reset the runtime Comfort setpoint to the basic setpoint.

Notes on setpoint adjustment (LTE mode with Synco only)

- Central setpoint shift is used for summer / winter compensation in particular.
- Setpoint shift does not affect the setpoints stored in parameters P08, P11, P12, P33.
- Local shift and central shift are added together.
- Applies only to Comfort and Economy setpoints; Protection setpoints are not shifted centrally.
- The resulting (current) setpoint heating and cooling is limited by the Protection setpoint; if Protection setpoint is OFF, then minimum 5 °C and maximum 40 °C are used.
- The resulting setpoints for cooling and heating of the same operating mode have a minimum distance of 0.5 K between them.
- The result of local and central shift, together with the room operating mode, is used by the thermostat for temperature control (current setpoint).

Setpoint priority
Setpoint Master (RMB)

- The room thermostat always adopts the received setpoints from the controller RMB795. Thus the setpoints locally adjusted on the RDG room thermostats are overwritten by the setpoints of the room group (e.g. every 15 min).

RDG160KN: On RMB SW Version ≥ 2.0 it is possible to define under which circumstances the controller has to send out the setpoints. See "Setpoint priority" and "Setpoint Master" functions on RMB.

RDG100KN: The local setpoints are always overwritten.

3.4 Applications overview

The thermostats support the following applications, which can be configured using the DIP switches at the rear of the unit or a commissioning tool.

Remote configuration

DIP switches 1...3 need to be set to OFF (remote configuration, factory setting) to select an application via commissioning tool.

Remote configuration, via commissioning tool (factory set)

- Synco ACS
- ETS

DIP switches



The tools provide the applications described in section 3.4.1 (basic applications). For universal applications (chilled ceiling, etc.) and compressor applications, refer to sections 3.4.2, 3.4.3, 3.6.9, 3.6.10.

3.4.1 Applications for fan coil systems

Applications, DIP setting, Control outputs		
• 2-pipe fan coil unit Using RDG100KN, RDG160KN	• 2-pipe fan coil unit and electric heater Using RDG100KN, RDG160KN	• 2-pipe fan coil unit and radiator / floor heating Using RDG100KN, RDG160KN
• 2-pipe / 2-stage fan coil unit Using RDG100KN, RDG160KN	• 4-pipe fan coil unit Using RDG100KN, RDG160KN	• 4-pipe fan coil unit and electric heater Using RDG100KN

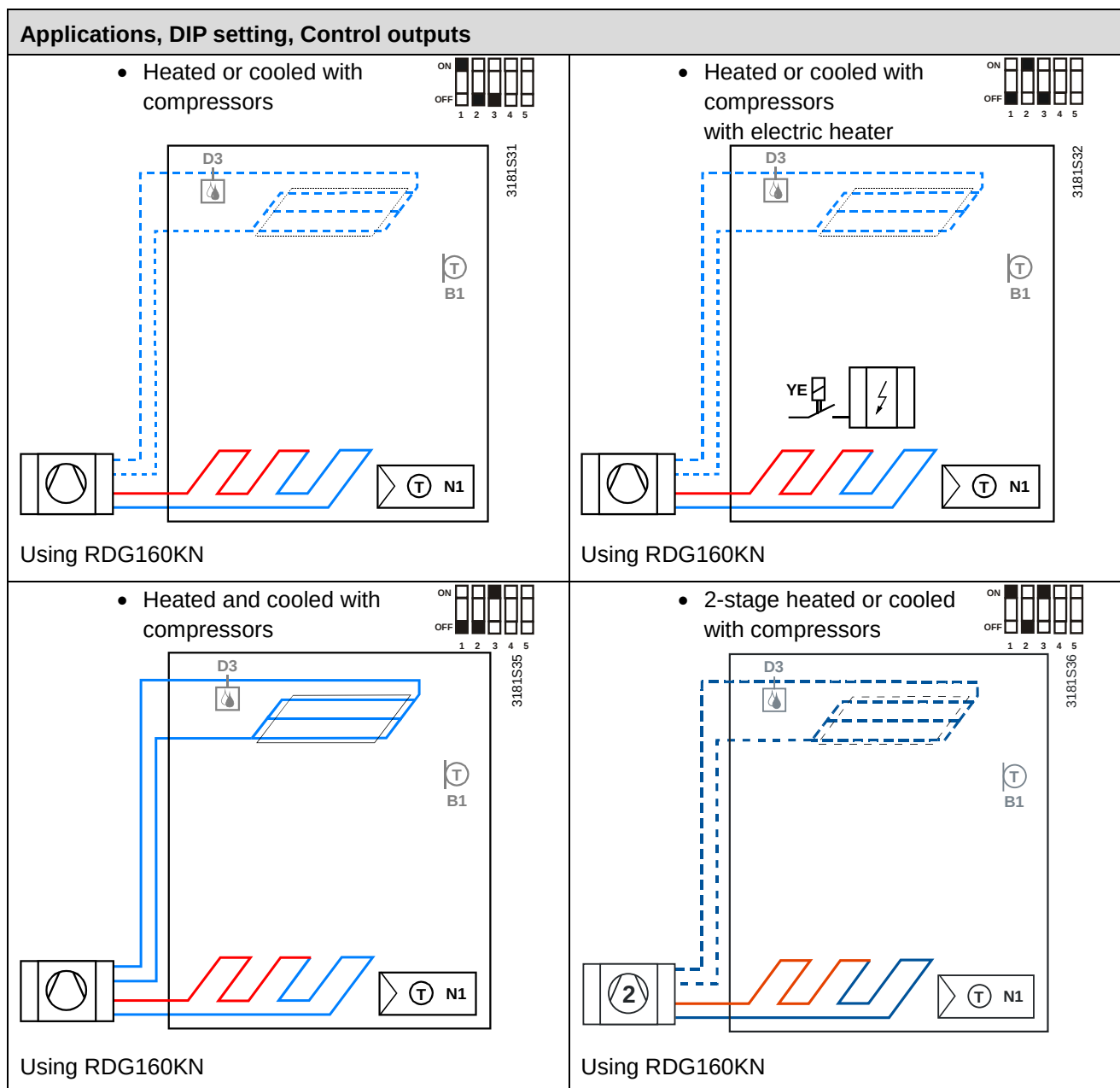
Product no.	Control outputs	Fan
RDG100KN	On/off, PWM, 3-position	3-speed, 1-speed
RDG160KN	DC 0...10 V	3-speed, 1-speed, DC 0...10 V
RDG160KN	On/off	DC 0...10 V

3.4.2 Applications for Universal systems

Applications, DIP setting, Control outputs		
Chilled / heated ceiling Using RDG100KN, RDG160KN	Chilled / heated ceiling and electric heater Using RDG100KN, RDG160KN	Chilled / heated ceiling and radiator / floor heating Using RDG100KN, RDG160KN
2-stage chilled / heated ceiling Using RDG100KN, RDG160KN	Chilled ceiling and radiator Using RDG100KN, RDG160KN	

Product no.	Control outputs
RDG100KN	On/off, PWM, 3-position
RDG160KN	On/off, DC 0...10 V

3.4.3 Applications for heat pump systems (RDG160KN)



Product no.	Control outputs	Fan
RDG160KN	On/off, DC 0...10 V	Disabled, DC 0...10 V

Key	Y1	Heating or heating / cooling valve actuator	M1	1-speed or 3-speed fan
	Y2	Cooling valve actuator	B1	Return air temperature sensor or external room temperature sensor (optional)
	YE	Electric heater	B2	Changeover sensor (optional)

Notes **RDG100KN**

- Use P46 / P47 to change output from On/Off (factory setting) to PWM.
- Use DIP switches 4 and 5 to change output from On/Off to 3-position.

RDG160KN

- Use P46 / P47 to change valve actuator output from DC (factory setting) to On/Off.
- Use DIP switch 4 to change fan output from DC (factory setting) to 3-speed.

3.5 Additional functions

Heating / cooling changeover via bus



Heating/cooling
changeover

The heating / cooling changeover information can be received via bus. This is only possible if the control sequence is set to automatic heating / cooling changeover (parameter P01 = 3) and no local input X1, X2, D1 is assigned with this function.

In the absence of the required information (e.g. due to problems with data communication, power failure, etc.), the thermostat operates in the last valid room operating mode (heating or cooling).

Automatic heating / cooling changeover via changeover sensor

If a cable temperature sensor (QAH11.1 + ARG86.3) is connected to X1 / X2, and parameter P38 / P40 is =2, the water temperature acquired by the changeover sensor is used to change over from heating to cooling mode, or vice versa.

- When the **water temperature** is above 28 °C (adjustable via parameter P37), the thermostat changes over to **heating mode**.

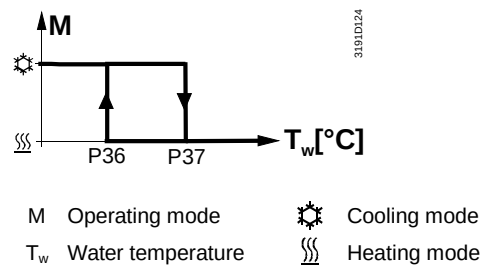
It stays in heating mode until the temperature falls below 16°C (adjustable via parameter P36).

- When the **water temperature** is below 16 °C (P36), the thermostat changes over to **cooling mode**.

It stays in cooling mode until the temperature rises above 28°C (P37).

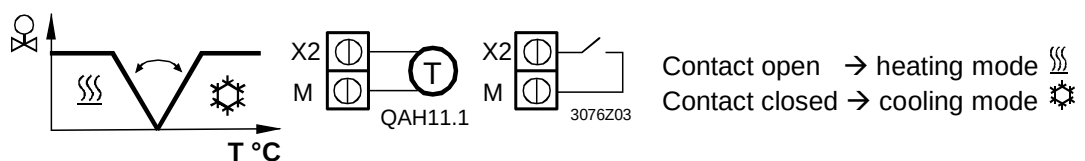
- If the water temperature is between the 2 changeover points immediately after power-up (inside the hysteresis), the thermostat starts in previous mode.

The water temperature is acquired at 30-second intervals and the operating state is updated accordingly.



Changeover switch

The QAH11.1 cable temperature sensor for automatic heating / cooling changeover can be replaced by an external switch for manual, remote changeover:



The sensor or switch can be connected to input terminal X2 or X1 or D1 (switch only), depending on the commissioning of the inputs (P38, P40, P42). See also section 3.9 "Multifunctional input".

Note By using an external switch as changeover, the Operating action (via parameters P39, P41 or P43) **cannot** be modified.

The assignment is fix: Contact open → heating mode (wavy lines)
Contact closed → cooling mode (snowflake)

Manual heating / cooling changeover	- Manual heating / cooling changeover means selection via changeover button on the thermostat by repeatedly pushing the button until the required mode is shown on the display (automatic changeover is done via bus or via an external sensor / switch connected to X1, X2, or D1). - If manual heating / cooling changeover is commissioned (P01 = 2), then heating / cooling mode cannot be changed via bus / changeover sensor / switch; it will remain in the last mode as selected locally via button.
External / return air temperature sensor	The thermostat acquires the room temperature via built-in sensor, external room temperature sensor (QAA32), or external return air temperature sensor (QAH11.1) connected to multifunctional input X1 or X2. Inputs X1 or X2 must be commissioned accordingly. See section 3.9 "Multifunctional input".
Purge function	The changeover sensor ensures changeover from heating to cooling mode based on the acquired water temperature. We recommend activating the "Purge" function (parameter P50) with 2-port valves. This function ensures correct acquisition of the medium temperature even if the 2-port valve is closed for an extended period of time. The valve is then opened for 1 to 5 minutes (adjustable) at 2-hour intervals during off hours.
Avoid damage from moisture	In very warm and humid climates, the fan can be run periodically or continuously at a low fan speed (e.g. in empty apartments or shops) in Economy mode by setting parameter P61, in order to avoid damage from moisture due to lack of air circulation. See also section 3.8 "Fan control", under "Fan kick function".
Avoid cold air in heating mode	To let the heating coil reach its temperature, the fan start can be delayed by a time period set via parameter P67.
Minimum output ON-time / OFF-time	Limit the On/Off switching cycle to protect the HVAC equipment, e.g. compressor and reduce wear and tear. The minimum output on-time and off-time for On/Off control output can be adjusted from 1 to 20 minutes via parameters P48 and P49. The factory setting is 1 minute. Readjusting the setpoint or heating / cooling mode changeover immediately results in calculation of the output state; the outputs may not hold the minimum 1-minute On/Off time. If parameter P48 or P49 is set to above 1 minute, the minimum On/Off time for the control output is maintained as set, even if the setpoint or changeover mode is readjusted.
Floor heating / Floor cooling	All heating sequences can also be used for floor heating. You can use fan coil unit heating / cooling sequences for floor heating or cooling by disabling the fan via parameter P52.
Floor temperature limitation function	The floor temperature should be limited for 2 reasons: Comfort and protection of the floor. The floor temperature sensor, connected to multifunctional input X1 or X2, acquires the floor temperature. If the temperature exceeds the parameterized limit (parameter P51), the heating valve is fully closed until the floor temperature drops to a level 2 K below the parameterized limit. This function is factory-set to OFF (disabled). Input X1 or X2 must be commissioned accordingly (P38 or P40 = 1). See section 3.9 "Multifunctional input".

Recommended values
for P51:

Living rooms:

Up to 26 °C for long-time presence, up to 28 °C for short-time presence.

Bath rooms:

Up to 28 °C for long-time presence, up to 30 °C for short-time presence.

The table below shows the relation between parameter, temperature source and temperature display:

Parameter P51	External temp. sensor available	Source for display of room temperature	Output control according to	Floor temp. limit function
OFF	No	Built-in sensor	Built-in sensor	Not active
OFF	Yes	External temp. sensor	External temp. sensor	Not active
10...50 °C	No	Built-in sensor	Built-in sensor	Not active
10...50 °C	Yes	Built-in sensor	Built-in sensor + limit by external sensor	Active

The "Floor temperature limitation" function influences the outputs listed in the table below:

				"Floor temp. limit" function has impact on			Remark
Application	Output Y1	Output Y2	Output Y3	Heating (P01 = 0/2/3)	Cooling (P01 = 1/2/3)	Heat. and cool. (P01 = 4)	
2-pipe	H/C valve			Y1	N/A		
2-pipe & el heater	H/C valve	El heater		Y2	Y2 *)		Only el heater
2-pipe & radiator	H/C valve	Radiator		Y2	Y2		Only radiator
4-pipe	Heating valve	Cooling valve		Y1	N/A	Y1	
4-pipe & el heater	Heating valve	Cooling valve	El. heater	Y3	N/A	Y3	Only el heater
2-stage	1st H/C	2nd H/C		Y1, Y2	N/A		

*) If P13 = ON → electric heater in cooling mode

Note Either floor temperature sensor or external room temperature sensor can be used.

Supply air temperature limitation (RDG160KN)

This function increases the comfort in the room by keeping the supply air temperature of the fan coil unit between the selected minimum and maximum temperature limits.

If the supply air temperature exceeds a limit, the thermostat reduces the corresponding valve position until the supply air temperature is back in the limits.

In case the air flow is too low (especially with DC 0...10 V fans), this prevents cold air from dumping into the room / warm air from bubbling straight up instead of circulating.

To enable this function, the multifunctional input, to which the supply air sensor is connected, needs to be set to "Supply air sensor" (e.g. P38=9). Then the parameters for the limits are visible (P63: minimum supply air temperature, P64: maximum supply air temperature).

This function is only active in Comfort mode and can only be used with DC 0...10 V actuators.

Note For applications with electric heater, this function is not available.

Dew point monitoring



Fault state

Fault information

Dew point monitoring is essential to prevent condensation on the chilled ceiling (cooling with fan disabled, parameter P52). It helps avoid associated damage to the building.

A dew point sensor with a potential-free contact is connected to multifunctional input X1, X2 or D1. If there is condensation, the cooling valve is fully closed until no more condensation is detected, and the cooling output is disabled temporarily.

The condensation symbol "⬆" is displayed during temporary override and the fault "Condensation in room" will be sent via bus.

The input must be commissioned accordingly (P38, P40, P42).

See section 3.9 "Multifunctional input".

Button lock

If the "Button lock" function is enabled by parameter P14, the buttons will be locked or unlocked by pressing the right button for 3 seconds.

If "Auto lock" is configured, the thermostat will automatically lock the buttons 10 seconds after the last adjustment.

Switch off external equipment in Protection mode (RDG160KN)

The external equipment (e.g. fan coil unit) can be switched off via relay output Q3 of the thermostat, in order to reduce energy consumption when the thermostat is in Protection mode and no temperature control is requested.

The "Switch off in Protection" function is enabled via parameter P74 = 1.

The relay function can be checked via diagnostic parameter d10.

This function is only available for applications with DC 0...10 V fan (DIP 4 = off or P53 = 3), or for universal applications (without fan).

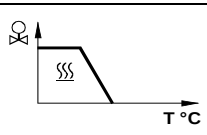
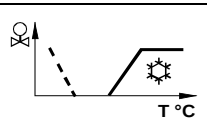
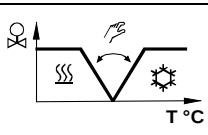
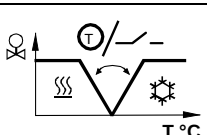
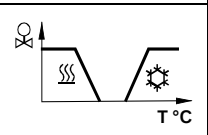
3.6 Control sequences

3.6.1 Sequences overview (setting via parameter P01)

The main control sequence (i.e. the water coil sequence of the fan coil unit) can be set via **parameter P01**.

The following sequences can be activated in the thermostats (each without or with auxiliary heating).

The available sequences depend on the application (selected via DIP switch, see section 3.4).

Parameter	P01 = 0	P01 = 1	P01 = 2	P01 = 3	P01 = 4
Sequence					
Available for basic application ¹⁾ : ↓	Heating	Cooling ↘ = heating sequence for el. heater / radiator	Manually select heating or cooling sequence (using the button on the thermostat)	Automatic heating / cooling changeover via external water temperature sensor or remote switch	Heating and cooling sequence, i.e. 4-pipe
2-pipe, 2-pipe & el heater 2-pipe & radiator	✓	✓	✓	✓	
4-pipe 4-pipe & el heater			✓ ²⁾	✓ ²⁾	✓
2-stage heating or cooling	✓	✓	✓	✓	

- Notes:
- 1) For chilled / heated ceiling and radiator applications, see section 3.6.9;
 - 2) For manual and automatic changeover with 4-pipe applications, see section 3.6.6:
 - 4-pipe **manual** changeover (P01 = 2) means activating either cooling or heating outputs
 - 4-pipe **automatic** changeover (P01 = 3) means swapping the control outputs according to a heating / cooling sensor or remote switch ("main and secondary" application), see section 3.6.6.

For the relation between setpoints and sequences, see section 3.6.11.

3.6.2 Application mode

The behavior of the thermostat can be influenced by a building automation and control system (BACS) via bus with the command "Application mode". With this signal, cooling and/or heating activity can be enabled or disabled. Application mode is supported in LTE mode and S-mode.

The RDG KNX thermostats support the following commands:

#	Application mode	Description	Control sequence enabled
0	Auto	Thermostat automatically changes between heating and cooling	Heating and/or cooling
1	Heat	Thermostat is only allowed to heat	Heating only
2	Morning warm-up	If "Morning warm-up" is received, the room should be heated up as fast as possible (if necessary). The thermostat will only allow heating	Heating only
3	Cool	Thermostat is only allowed to provide cooling	Cooling only
4	Night purge	Not supported by fan coil applications	N/A (= Auto)
5	Pre-cool	If "Pre-cool" is received, the room should be cooled down as fast as possible (if necessary). The thermostat will only allow cooling	Cooling only
6	Off	Thermostat is not controlling the outputs, which means all outputs go to off or 0%	Neither heating nor cooling
8	Emergency heat	The thermostat should heat as much as possible. The thermostat will only allow heating	Heating only
9	Fan only	All control outputs are set to 0% and only the fan is set to high speed. Function will be terminated by any operation on the thermostat	Run fan in high speed

With all other commands, the thermostat behaves like in Auto mode, i.e. heating or cooling according to demand.



The state (heating or cooling) of the thermostat can be monitored with the ACS tool (diagnostic value "Control sequence"). The last active mode is displayed when the thermostat is in the dead zone or temperature control is disabled.

Heating OR cooling

With a 2 pipe application, the control sequence state is determined by the application mode (see section 3.6.2) and by the state of the heating / cooling changeover signal (via local sensor or bus), or fixed according to the selected control sequence (P01 = heating (0) / cooling (1)).

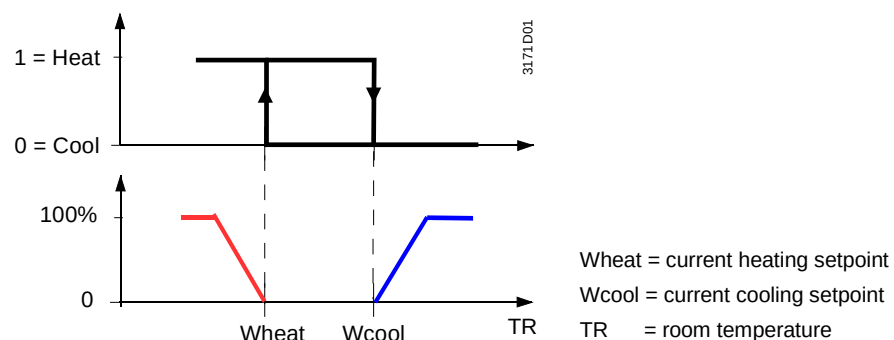
Application mode (via bus)	State changeover / continuous heating or cooling	Control sequence state (ACS diagnostic value)
Auto (0)	Heating	Heating
	Cooling	Cooling
Heat (1), (2), (8)	Heating	Heating
	Cooling	Heating
Cool (3), (5)	Heating	Cooling
	Cooling	Cooling
Night purge (4), Fan only (9)	Heating	Heating
	Cooling	Cooling

Heating AND cooling

With a 4-pipe, 2-pipe with electric heater, and 2-pipe with radiator application, the control sequence state depends on the application mode and on the heating / cooling demand.

Application Mode (via bus)	Heating / cooling demand	Control sequence state (ACS diagnostic value)
Auto (0)	Heating	Heating
	No demand	Heating / cooling depending on last active sequence
	Cooling	Cooling
Heat (1), (2), (8)	Heating	Heating
	No demand	Heating
	Cooling	Heating
Cool (3), (5)	Heating	Cooling
	No demand	Cooling
	Cooling	Cooling
Night purge (4), Fan only (9)	No temperature control active	Heating / cooling depending on last active sequence

The value of the output as a function of the room temperature is shown in the following diagram in case of a heating and cooling system:



3.6.3 2-pipe fan coil unit

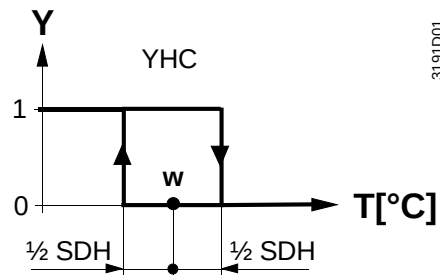
On 2-pipe applications, the thermostat controls a valve in heating / cooling mode with changeover (automatically or manually), heating only, or cooling only. Cooling only is factory-set (P01 = 1).

On/Off control

Control sequence
On/Off output

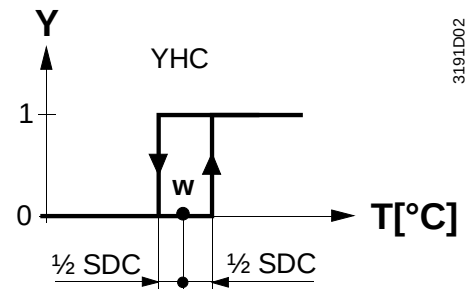
The diagrams below show the control sequence for 2-position control.

Heating mode



T[°C] Room temperature
w Room temperature setpoint
YHC Control command "Valve"

Cooling mode



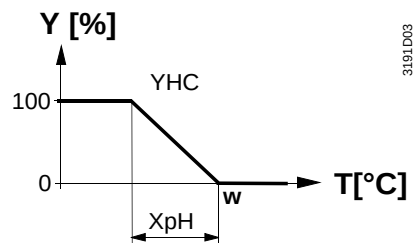
SDH Switching differential "Heating" (P30)
SDC Switching differential "Cooling" (P31)

Modulating control: 3-position, PWM or DC 0...10V

Control sequence
modulating output

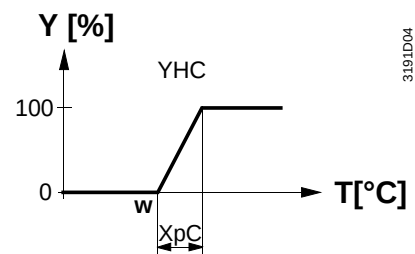
The diagrams below show the control sequence for modulating PI control.

Heating mode



T[°C] Room temperature
w Room temperature setpoint
YHC Control command "Valve"

Cooling mode



XpH Proportional band "Heating" (P30)
XpC Proportional band "Cooling" (P31)

Note: The diagrams only show the PI thermostat's proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.4 2-pipe fan coil unit with electric heater

Heating or cooling with auxiliary heater

On 2-pipe applications with electric heater, the thermostat controls a valve in heating / cooling mode with changeover, heating only, or cooling only plus an auxiliary electric heater.
Cooling only is factory-set (P01 = 1) with enabled electric heater (P13).

Electric heating, active in cooling mode

In cooling mode, the valve receives an **OPEN** command if the acquired temperature is above the setpoint.
The electric heater receives an **ON** command if the acquired room temperature drops below "setpoint" minus "dead zone" (= setpoint for electric heater) while the electric heater is enabled (parameter P13 = ON).

Note: "Setpoint for electric heater" is limited by parameter "Maximum setpoint for Comfort mode" (P10).

Electric heating in heating mode

In heating mode, the valve receives an **OPEN** command if the acquired temperature is below the setpoint. The electric heater is used as an additional heating source when the heating energy controlled by the valve is insufficient.
The electric heater receives an **ON** command, if the temperature is below "setpoint" minus "setpoint differential" (= setpoint for electric heater).

Electric heating and manual changeover

The electric heater is active in heating mode only and the control output for the valve is permanently disabled when manual changeover is selected (P01 = 2).

Digital input "Enable electric heater"

Remote enabling / disabling of the electric heater is possible via input X1, X2 or D1 for tariff regulations, energy savings, etc.
Input X1, X2, or D1 must be commissioned accordingly (parameters P38, P40, P42). See section 3.9 "Multifunctional input".



Enable electric heater

The electric heater can also be enabled / disabled via bus.

Note: If "Enable electric heater" input is used via bus, then the function **must not** be assigned to a local input X1, X2 or D1.



Caution

An electric heater must always be protected by a safety limit thermostat!

On/Off electric heater on RDG160KN

- With a DC 0...10 V (ECM) fan it is possible to select On/Off control for the electric heater by setting parameter P47 = 1. The electric heater has to be connected to output Q2.
- The electric heater starts with a delay of 15 s, to make sure the fan delivers sufficient air flow to dissipate the heat.

Adaptive temperature compensation for electric heater

When an electric heater is connected directly to output Q2, the current causes the relay contact to heat up. This falsifies the reading of the internal temperature sensor. The thermostat compensates the temperature if the rated power of the electric heating is entered in parameter P45.

Factory setting P45: 0.0 kW, setting range: 0.0 ...1.2 kW.

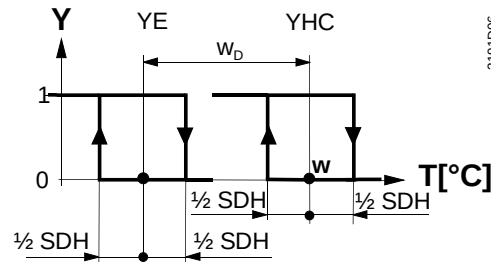
On/Off control

Control sequence
On/Off output

The diagrams below show the control sequence for 2-position.

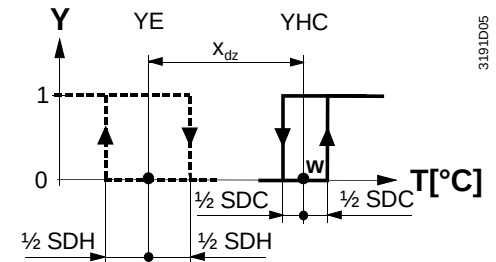
Heating mode

(automatic changeover = heating or heating only)

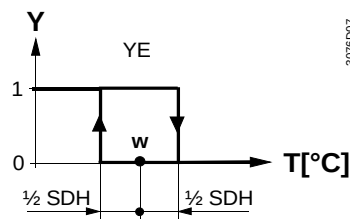


Cooling mode

(man. / auto. changeover = cooling or cooling only)



Heating mode with manual changeover (P01 = 2) (manual changeover = heating)



T[°C] Room temperature
W Room temperature setpoint
YHC Control command "Valve"
YE Control command "Electric heater"
SDH Switching differential "Heating" (P30)
SDC Switching differential "Cooling" (P31)
X_{dz} Dead zone (P33)
w_D Setpoint differential (P34)

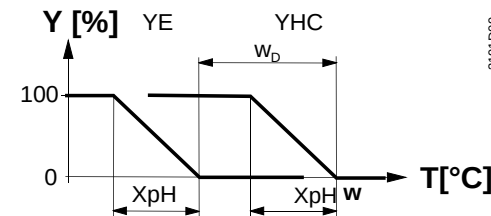
Modulating control: 3-position, PWM or DC 0...10V

Control sequence
modulating output

The diagrams below show the control sequence for modulating control.

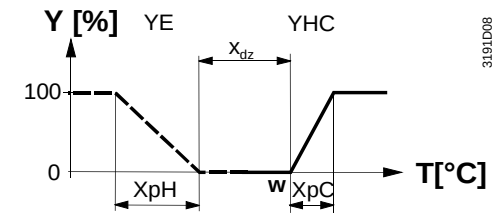
Heating mode

(automatic changeover = heating or heating only)



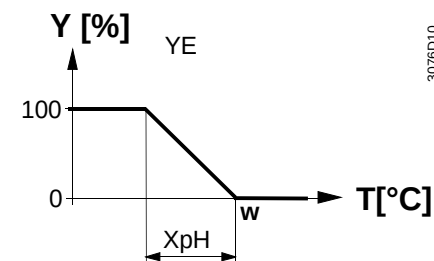
Cooling mode

(man. / auto. changeover = cooling or cooling only)



Heating mode with manual changeover (P01 = 2)

(manual changeover = heating)



T[°C] Room temperature
W Room temperature setpoint
YHC Control command "Valve"
YE Control command "Electric heater"
XpH Proportional band "Heating" (P30)
XpC Proportional band "Cooling" (P31)
X_{dz} Dead zone (P33)
w_D Setpoint differential (P34)

Note: The diagrams only show the PI thermostat's proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.5 2-pipe fan coil unit with radiator or floor heating

Heating or cooling with radiator or floor heating

On 2-pipe applications with radiator, the thermostat controls a valve in heating / cooling mode with changeover, heating only, or cooling only plus a radiator valve. Cooling only is factory-set (P01 = 1).

Radiator, active in cooling mode

In cooling mode, the valve receives an **OPEN** command if the acquired temperature is above the setpoint.
The radiator receives an **ON** command if the acquired room temperature drops below "setpoint" minus "dead zone" (= setpoint for radiator).

Radiator in heating mode

In heating mode, the radiator receives an **OPEN** command if the acquired temperature is below the setpoint. The fan coil unit is used as an additional heat source when the heat energy controlled by the radiator is insufficient.
The fan coil unit receives an **ON** command if the temperature is below "setpoint" minus "setpoint differential" (= setpoint for fan coil unit).

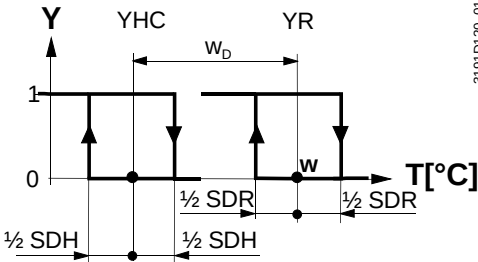
Floor heating

The radiator sequence can also be used for floor heating.
The "Floor heating limitation" function is described on page 29.

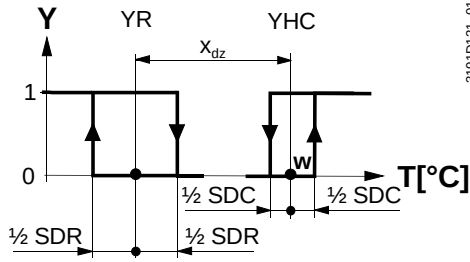
On/Off control

The diagrams below show the control sequence for 2-position control.

Heating mode



Cooling mode



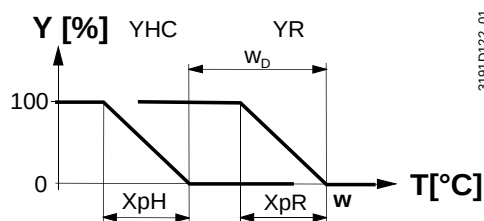
T[°C] Room temperature
W Room temperature setpoint
YHC Control command "Valve" or "Compressor"
YR Control command "Radiator"

SDH Switching differential "Heating" (P30)
SDC Switching differential "Cooling" (P31)
SDR Switching differential "Radiator" (P32)
X_{dz} Dead zone (P33)
w_D Setpoint differential (P34)

Modulating control: 3-position, PWM or DC 0...10 V

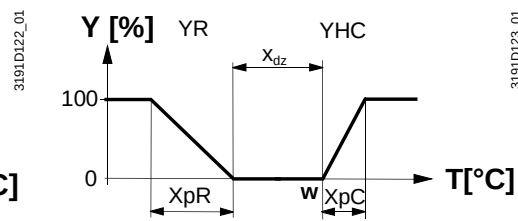
The diagrams below show the control sequence for modulating PI control.

Heating mode



T[°C] Room temperature
W Room temperature setpoint
YHC Control command "Valve"
YR Control command "Radiator"

Cooling mode



XpH Proportional band "Heating" (P30)
XpC Proportional band "Cooling" (P31)
XpR Proportional band "Radiator" (P32)
Xdz Dead zone (P33)
wD Setpoint differential (P34)

Note: The diagrams only show the PI thermostat's proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.6 4-pipe fan coil unit

Heating and cooling

On 4-pipe applications, the thermostat controls 2 valves in heating and cooling mode, heating / cooling mode by manual selection, or heating and cooling mode with changeover. Heating and cooling mode (P01 = 4) is factory-set.

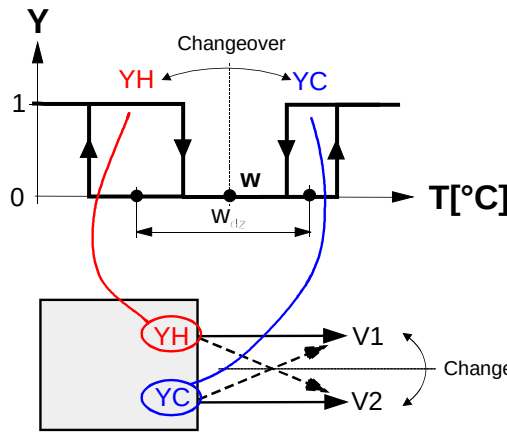
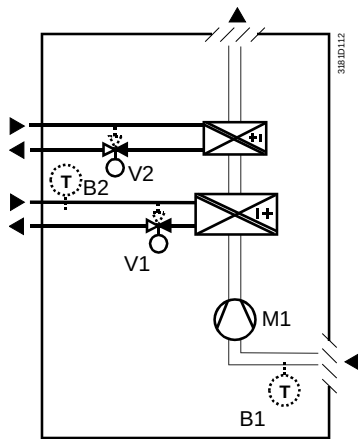
4-pipe application with manual changeover

The heating or cooling output can be released via operating mode button if parameter P01 is set to Manual (P01 = 2).

"Main and secondary" application (4-pipe with changeover)

If parameter P01 is set to changeover (P01 = 3), the heating and cooling output is swapped according to the input state of the changeover sensor / switch / bus input (see automatic heating and cooling changeover sensor in section 3.5). This mode is used for the so-called "Main and secondary" application. This is a 4-pipe fan coil unit system with different capacities of the 2 coils. The water circuit is changed to optimize the energy exchange depending on the season (summer / winter):

- Winter: Large coil (V1) for heating, small coil (V2) for cooling
- Summer: Large coil (V1) for cooling, small coil (V2) for heating



Note:
This example shows On/Off control; for modulating control, connect the appropriate output terminals

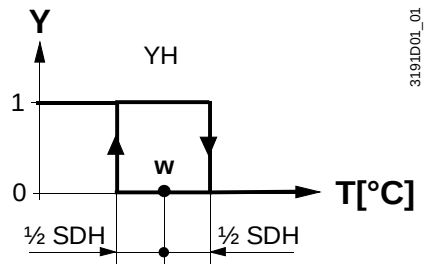
Notes:

- The parameter for the heating and cooling changeover sensor (B2 in the above diagram) must be set to 2 (X1 or X2, P38 or P40).
- The thermostat assumes winter operation when B2 > P37 (factory setting 28 °C).
- The thermostat assumes summer operation when B2 < P36 (factory setting 16 °C).

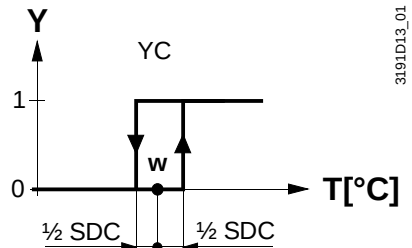
On/Off control

The diagrams below show the control sequence for 2-position control.

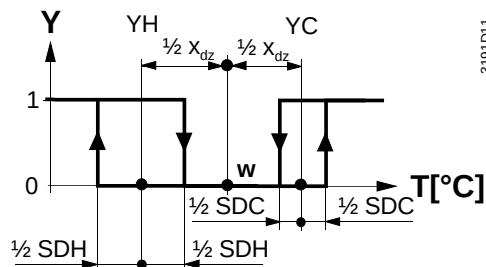
Heating mode with manual selection
(P01 = 2) or
for P09 >= P10 in heating sequence *)



Cooling mode with manual selection
(P01 = 2) or
for P09 >= P10 in cooling sequence *)



Heating and cooling mode (P01 = 04)

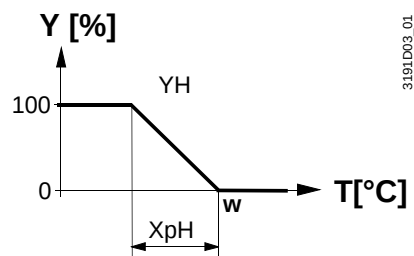


T[°C] Room temperature
w Room temperature setpoint
YH Control command "Valve" (heating)
YC Control command "Valve" (cooling)
SDH Switching differential "Heating" (P30)
SDC Switching differential "Cooling" (P31)
Xdz Dead zone (P33)

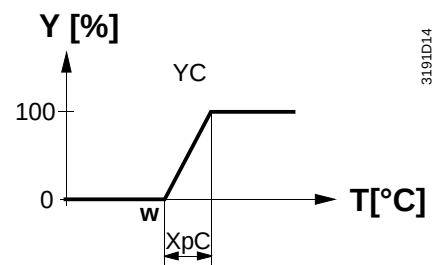
Modulating control: 3-position, PWM, or DC 0...10 V

The diagrams below show the control sequence of modulating PI control.

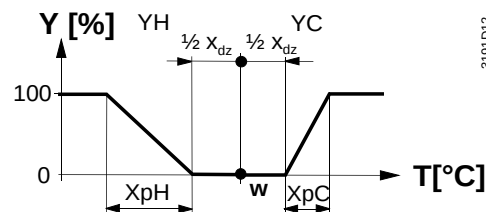
Heating mode with manual selection
(P01 = 2) or
for P09 >= P10 in heating sequence *)



Cooling mode with manual selection
(P01 = 2) or
for P09 >= P10 in cooling sequence *)



Heating and cooling mode (P01 = 04)



T[°C] Room temperature
w Room temperature setpoint
YH Control command "Valve" (heating)
YC Control command "Valve" (cooling)
XpH Proportional band "Heating" (P30)
XpC Proportional band "Cooling" (P31)
Xdz Dead zone (P33)

*) P09, P10 with software V1.20 and later, see section 3.3.1

Note: The diagrams only show the PI thermostat's proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.7 4-pipe fan coil unit with electric heater (RDG100KN)

Heating and cooling with auxiliary heater

On 4-pipe applications with electric heater, the thermostat controls 2 valves in heating and cooling mode by manual selection, heating and cooling mode with automatic changeover, heating only, or cooling only plus an auxiliary electric heater. Heating and cooling is factory-set (P01 = 4).

Electric heating in heating mode

The electric heater is used as an additional heat source when the heating energy controlled by the valve is insufficient.
The electric heater receives an **ON** command when the temperature is below "setpoint" minus "1/2 "dead zone" minus "setpoint differential" (= setpoint for electric heater).

Digital input "Enable electric heater"

Remote enabling / disabling of the electric heater is possible via input X1, X2, or D1 for tariff regulations, energy saving, etc.
Input X1, X2, or D1 must be commissioned accordingly (parameters P38, P40, P42). See section 3.9 "Multifunctional input".



Enable electric heater

The electric heater can also be enabled / disabled via bus.

If the bus input is used, then the function must NOT be assigned to a local input X1, X2 or D1.



Caution An electric heater must always be protected by a safety limit thermostat!

4-pipe application with manual changeover

The heating or cooling output can be released via operating mode button if parameter P01 is set to Manual (P01 = 2).

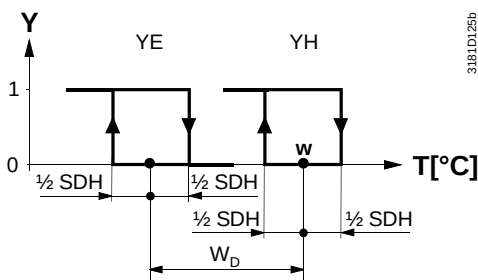
"Main and secondary" application

See section 3.6.6.

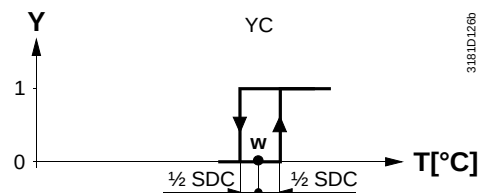
On/Off control

The diagrams below show the control sequence for 2-position control.

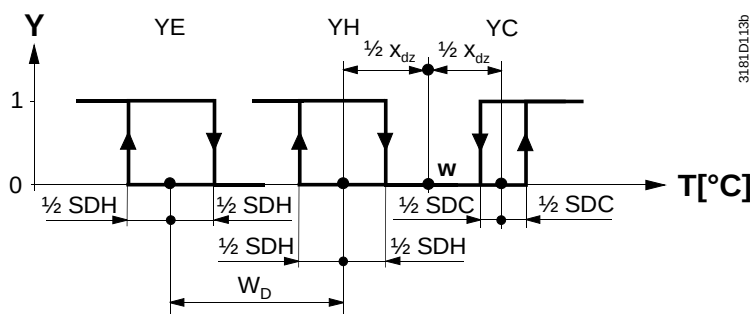
Heating mode with **manual** selection (P01 = 2)



Cooling mode with **manual** selection P01 = 2)



Heating and cooling mode (P01 = 4)

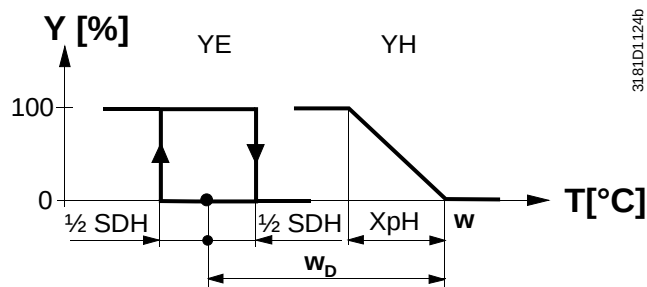


T [°C] Room temperature
w Room temperature setpoint
YE Control command "EI heater"
YH Control command "Valve" (heating)
YC Control command "Valve" (cooling)
SDH Switching differential "Heating" (P30)
SDC Switching differential "Cooling" (P31)
X_{dz} Dead zone (P33)
W_D Setpoint differential (P34)

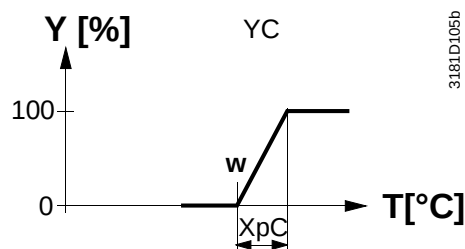
Modulating control: 3-position or PWM

The diagrams below show the control sequence of modulating PI control.

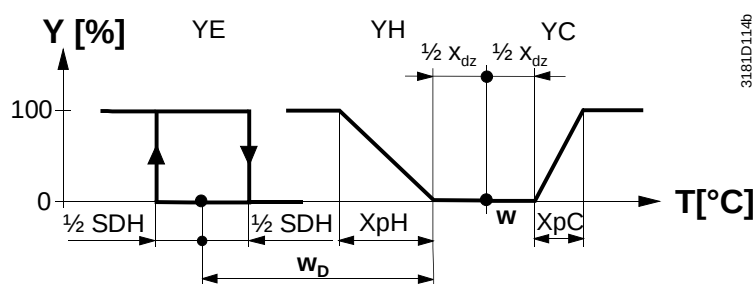
Heating mode with manual selection (P01 = 2)



Cooling mode with manual selection P01 = 2)



Heating and cooling mode (P01 = 4)



T [°C]	Room temperature
w	Room temperature setpoint
YE	Control command "El heater" (only On/Off)
YH	Control command "Valve" (heating) (On/Off or PWM, not 3-position)
YC	Control command "Valve" (cooling) (On/Off, PWM or 3-position)
XpH	Proportional band "Heating" (P30)
XpC	Proportional band "Cooling" (P31)
Xdz	Dead zone (P33)
wD	Setpoint differential (P34)

Note: The diagrams only show the PI thermostat's proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

- Notes:
- YH can only be On/Off or PWM
 - YC can be On/Off, PWM or 3-position
 - YE can only be On/Off

3.6.8 2-pipe / 2-stage heating or cooling

2-stage heating or cooling

On 2-stage applications, the thermostat controls 2 valves or compressors in heating or cooling mode or changeover (automatically or manually).
"Cooling only" is factory-set (P01 = 1).

Heating mode

In heating mode, the 1st stage is activated if the acquired temperature is below the setpoint.
The 2nd stage is activated if the acquired room temperature drops below "setpoint" minus "setpoint differential".

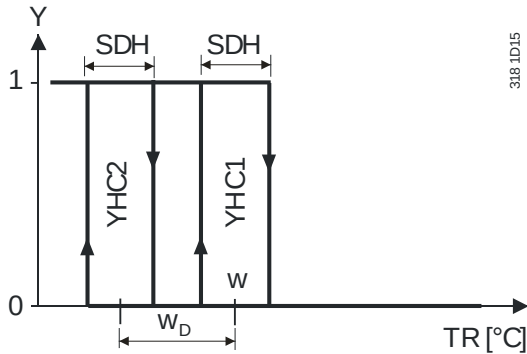
Cooling mode

In cooling mode, the 1st stage is activated if the acquired temperature is above the setpoint.
The 2nd stage is activated if the acquired room temperature rises above "setpoint" plus "setpoint differential".

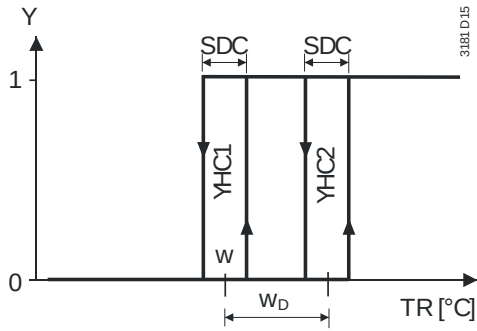
On/Off control

The diagrams below show the control sequence for 2-position control.

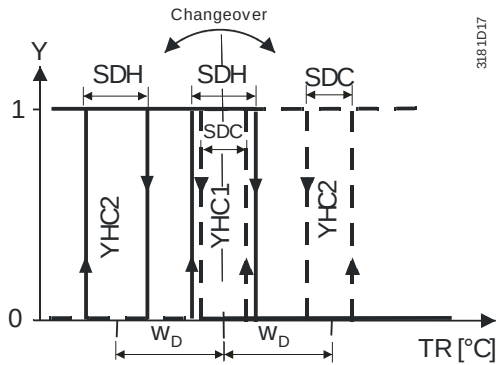
Heating mode (P01 = 0)



Cooling mode P01 = 1



Changeover (P01 = 2 or P01 = 3)

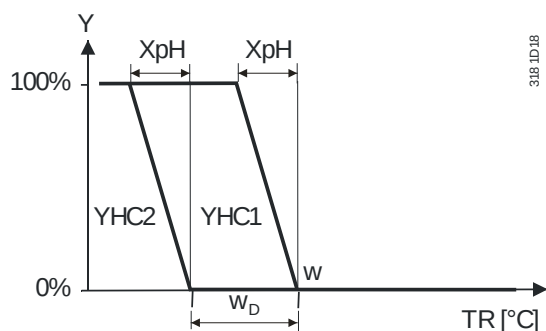


T [°C]	Room temperature
w	Room temperature setpoint
YHC1	Control command "Stage 1"
YHC2	Control command "Stage 2"
SDH	Switching differential "Heating" (P30)
SDC	Switching differential "Cooling" (P31)
w _D	Setpoint differential (P34)

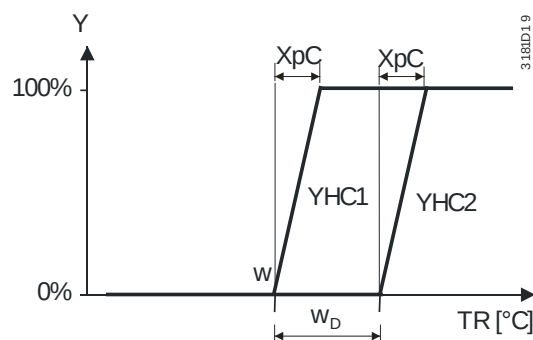
Modulating control: 3-position, PWM or DC 0...10 V

The diagrams below show the control sequence of modulating PI control.

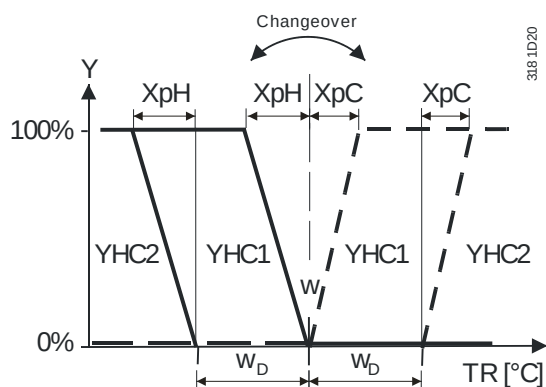
Heating mode (P01 = 0)



Cooling mode P01 = 1)



Changeover (P01 = 2 or P01 = 3)



T[°C]	Room temperature
w	Room temperature setpoint
YHC1	Control command "Stage 1"
YHC2	Control command "Stage 2"
XpH	Proportional band "Heating" (P30)
XpC	Proportional band "Cooling" (P31)
w _D	Setpoint differential (P34)

Note: The diagrams only show the PI thermostat's proportional part.

Setting the sequence and the control outputs

Refer to sections 3.4 "Applications", 3.6.1 "Sequences", and 3.7 "Outputs".

3.6.9 Chilled / heated ceiling and radiator applications

For chilled / heated ceiling and radiator,

- set the corresponding basic application according to section 3.4
- disable the fan (P52)

The following applications are available:

Application for chilled / heated ceiling, radiator	Set basic application	See section	Sequences
Chilled / heated ceiling with changeover	2-pipe	3.6.3	H (\) C (/)
Chilled / heated ceiling & el heater (cooling only: disable el heater via P13)	2-pipe and electric heater	3.6.4	El H + H (~~↖~~ \) El H + C (~~↖~~ /) C (/)
Chilled / heated ceiling and radiator	2-pipe and radiator	3.6.5	H + rad (\ r \) Rad + C (r \ /)
Chilled ceiling and radiator	4-pipe	3.6.6	H + C (\ /)
Chilled / heated ceiling, 2-stage	2-stage heating or cooling	3.6.8	H + H (\ \) C + C (/ /)

3.6.10 Compressor applications (RDG160KN)

For compressor applications,

- set the corresponding basic application according to section 3.4
- disable the fan (P52) or set the type of fan speed (P53)
- Select the type of control outputs (On/Off or DC 0...10 V, P46, P47)

The following applications are available:

Application for compressors in DX-type equipment	Set basic application	See section	Sequences
1-stage compressor	2-pipe	3.6.3	H (\) C (/)
1-stage compressor and el. heater (cooling only: disable el. heater via P13)	2-pipe and electric heater	3.6.4	El. H + H (~~↖~~ \) El. H + C (~~↖~~ /) C (/)
1-stage compressor for heating and cooling	4-pipe	3.6.6	H + C (\ /)
2-stage compressor	2-stage heating or cooling	3.6.8	H + H (\ \) C + C (/ /)

- Notes
- Minimum on/off time: P48 / P49 (only with On/Off control outputs)
 - Fan operation: P52 (0 = disabled, 1 = enabled)
 - Fan speed: P53 (1 = 1-speed, 2 = 3-speed, 3 = DC 0...10 V)
 - Control outputs DC 0...10 V: P46 = 2 (V1) P47 = 2 (V2)
 - Control outputs 2-position: P46 = 1 (V1) P47 = 1 (V2) (only with EC (DC) fan)

3.6.11 Setpoints and sequences

2-pipe and 2-stage applications

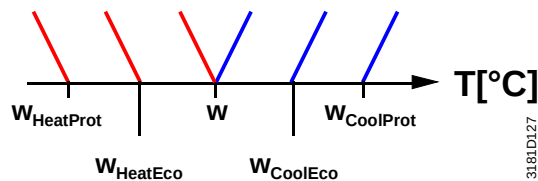
On changeover applications, the Comfort setpoints for heating and cooling sequence are the same (w).

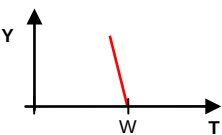
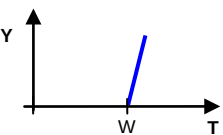
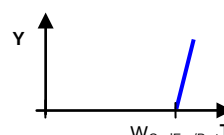
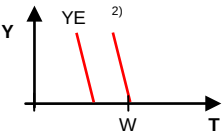
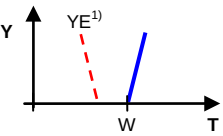
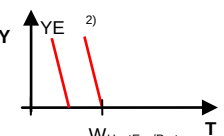
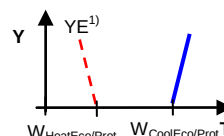
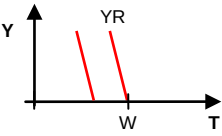
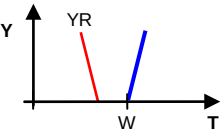
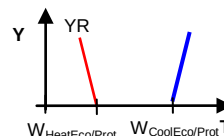
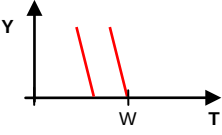
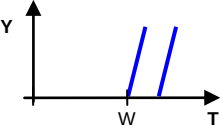
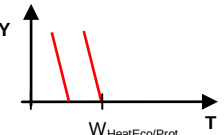
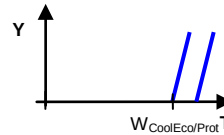
On 2-pipe applications with electric heater, the Comfort setpoint is either at the first heating sequence (in heating mode) or at the cooling sequence (in cooling mode).

On 2-pipe applications with radiator, the Comfort setpoint is either at the radiator sequence (in heating mode) or at the cooling sequence (in cooling mode).

The setpoints for Economy and Protection mode are below the Comfort setpoints (heating) and above the Comfort setpoints (cooling).

They can be set via parameters P11, P12 (Economy mode) and P65, P66 (Protection mode).



Application	Comfort mode		Economy / Protection mode	
	Heating	Cooling	Heating	Cooling
2-pipe				
2-pipe and electric heater				
2-pipe and radiator				
2-stage heating or cooling				

1) If P13 = ON

2) In case of manual changeover (P01 = 2), the first heating sequence is disabled to prevent heating (electric heater) and cooling (coil) at the same time

W = setpoint in Comfort mode

$W_{HeatEco/Prot}$ = setpoint heating in Economy or Protection mode

$W_{CoolEco/Prot}$ = setpoint cooling in Economy or Protection mode

YR = radiator sequence

YE = electric heater sequence

4-pipe applications

On 4-pipe applications, the Comfort setpoint (w) is in the middle of the dead zone, between the heating and cooling sequence.

The dead zone can be adjusted via parameter P33.

If manual changeover is selected, then either the cooling sequence or the heating sequence is released. In this case, the Comfort setpoint is at the selected heating or cooling sequence.

Application	Comfort mode			Economy / Protection mode
	Heating and cooling $P09 < P10$ *)	Heating only ¹⁾ or Heating and cooling $P09 < P10$ *)	Cooling only ¹⁾ or Heating and cooling $P09 \geq P10$ *)	
4-pipe				
4-pipe and electric heater				

1) Manual changeover, $P01 = 2$

*) $P09$, $P10$ with software V1.20 and later, see section 3.3.1

W = setpoint in Comfort mode

$W_{\text{HeatEco/Prot}}$ = heating setpoint for Economy or Protection mode

$W_{\text{CoolEco/Prot}}$ = cooling setpoint for Economy or Protection mode

YE = electric heater sequence

3.7 Control outputs

3.7.1 Overview

Overview of control outputs

Different control output signals are available. They need to be defined during commissioning (see below).

Control output Product no.	On/Off	PWM	3-position	DC 0...10 V
RDG100KN	Y1, Y2, Y3 (3 x NO)	Y1, Y3, (2 x PWM)	Y1/Y2, Y3/Y4 (2 x ▲ / ▼)	---
RDG160KN	Q1, Q2, (2 x NO)	---	---	Y10, Y20

On/Off control signal (2-position)

The valve receives the **OPEN/ON** command via control output Y1 (Q1 on RDG160KN) or Y3 (Q2 on RDG160KN) when...

1. the acquired room temperature is below the setpoint (heating mode) or above the setpoint (cooling mode).
2. the control outputs have been inactive for more than the "Minimum output OFF-time" (factory setting 1 minute, adjustable via parameter P48).

OFF command when...

1. the acquired room temperature is above the setpoint (heating mode) or below the setpoint (cooling mode).
2. the valve has been active for more than the "Minimum output on-time" (factory setting 1 minute, adjustable via parameter P49).

Electric heater control signal (On/Off)

The electric heater receives an **ON** command via the auxiliary heating control output (Y..., see Mounting Instructions) when...

1. the acquired room temperature is below the "Setpoint for electric heater"
2. the electric heater has been switched off for at least 1 minute

The **OFF** command for the electric heater is output when...

1. the acquired room temperature is above the setpoint (electric heater)
2. the electric heater has been switched on for at least 1 minute

Caution

A safety limit thermostat (to prevent overtemperatures) must be provided externally.

Note!

On RDG160KN the electrical heater can be controlled via the 2-position output (Q2) by setting P47 = 1. Adaptive temperature compensation: see 3.6.4.

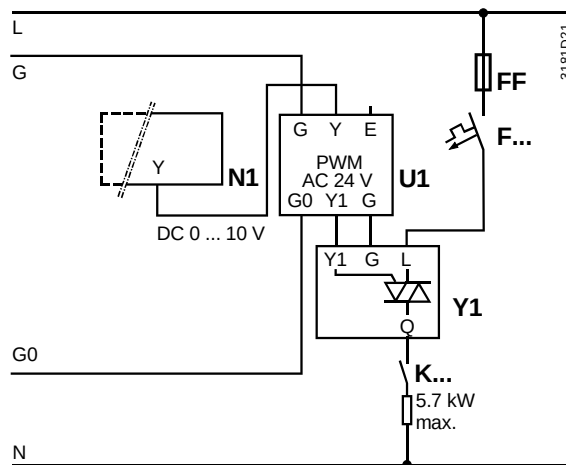
3-position control signal (RDG100KN only)

Heating: Output Y1 provides the **OPEN** command, and Y2 the **CLOSE** command to the 3-position actuator. Cooling: Same with Y3 and Y4.

The factory setting for the actuator's running time is 150 seconds. It can be adjusted via parameters P44 (Y1 and Y2) or P45 (Y3 and Y4).

The parameters are only visible if 3-position is selected via DIP switches 4 and 5.

Synchronization	1. When the thermostat is powered up, a closing command for the actuator running time + 150% is provided to ensure that the actuator fully closes and synchronizes to the control algorithm. 2. When the thermostat calculates the positions "fully close" or "fully open", the actuator's running time is extended + 150% to ensure the right actuator position is synchronized to the control algorithm. 3. After the actuator reaches the position calculated by the thermostat, a waiting time of 30 seconds is applied to stabilize the outputs.
PWM control (RDG100KN only)	The demand calculated by PI control from the current room temperature and set-point is provided via Y1 and Y3 to the valve actuator as a PWM (pulse width modulation) signal for thermal actuators. The output is activated for a period proportional to the heating / cooling demand and then switched off for the rest of the PWM interval. The interval is 150 seconds (factory setting). It can be adjusted via parameters P44 (Y1) or P45 (Y3). These parameters are only visible if 2-position is selected via DIP switches 4 and 5 and if PWM is selected via P46 and P47. Note! For PWM, the integral time (P35) must be set to 0.
PWM for thermal valve actuators	For thermal valve actuators, set the running time to 240 seconds. Note! • Never apply PWM to a motorized actuator • It is not possible to ensure exact parallel running of 2 or more thermal valve actuators. If several fan coil systems are controlled by the same room thermostat, preference should be given to motorized actuators with on / off or 3-position control
PWM for electric heaters	For electric heaters, set the running time to 90 seconds. To avoid burn-off of mechanical contacts by frequent switching, use a current valve in place of a relay or contactor. Note! For PWM, the integral time (P35) must be set to 0.
DC 0...10 V control	This function is available with RDG160KN only.
DC 0...10 V for valve actuators	The demand calculated by PI control from the current room temperature and setpoint is provided via Y10 and Y20 to the valve actuator as a continuous DC 0...10 V signal.
DC 0...10 V for electric heaters	• The demand calculated by PI control from the current room temperature and setpoint is provided via Y20 as a continuous DC 0...10 V signal. • The signal converter (SEM61.4) converts the DC 0...10 V signal to AC 24 V PDM pulses for the current valve. • The current valve (SEA45.1) supplies the electric heater with pulsed current. Note! On RDG160KN the electrical heater can be controlled via the On/Off output (Q2) by setting P47 = 1. Adaptive temperature compensation: see 3.6.4.



- N1 RDG160KN
 U1 Signal converter SEM61.4 (see Data Sheet N5102)
 Y1 Current valve SEA45.1 (see Data Sheet N4937)
 K... Safety loop (e.g. safety thermostat and high-temperature cutout)
 FF Very fast-acting fuse
 F... Overcurrent trip

3.7.2 Control outputs configuration (setting via DIP switches 4/5 or tool, and parameters P46/P47)

Overview

	Control outputs			
	ON / OFF (2-position)	Mod. PWM	Mod. 3-pos.	Mod. DC 0...10 V
Applications with 3-speed / 1-speed fan				
2-pipe	✓	✓	✓	✓
2-pipe and electric heater	✓	✓	✓	✓
2-pipe and radiator / floor heating	✓	✓	✓	✓
4-pipe	✓	✓	✓	✓
4-pipe and electric heater	✓	✓	(✓) *	
2-stage, cooling or heating	✓	✓	✓	✓
Applications with DC 0...10 V (ECM) fan				
2-pipe		✓		✓
2-pipe and electric heater		✓		✓
2-pipe and radiator / floor heating		✓		✓
4-pipe		✓		✓
2-stage, cooling or heating		✓		✓
Available with product no.➔	RDG100KN	RDG160KN	RDG100KN	RDG100KN

* (only possible for 1 actuator)

RDG100KN

The type of the control outputs (2- or 3-position) is set via DIP switches 4 and 5.

The patterns of DIP switches 4 and 5 are as follows:

ON	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
OFF					
	1	2	3	4	5

ON	☐	☐	☐	☐	☒
	☐	☐	☐	☒	☐
OFF					
	1	2	3	4	5

ON	☐	☐	☐	☒	☐
	☐	☐	☐	☐	☒
OFF					
	1	2	3	4	5

ON	☐	☐	☐	☒	☒
	☐	☐	☐	☒	☒
OFF					
	1	2	3	4	5

Y1/Y2 = 2-position

2-position

3-position

3-position

Y3/Y4 = 2-position

3-position

2-position

3-position

- Notes:
- If 2-position is selected, the factory setting is On/Off. If you want PWM (pulse width modulation), set parameters P46 and/or P47 to 2 = PWM.
 - 4-pipe with electric heater: As the electric heater requires 1 of 4 outputs, only the cooling valve actuator can be 3-position.
 - For commissioning via tool, all DIP switches have to be set to OFF. Control outputs need to be set via tool in this case.

For details concerning connection of peripheral devices and setting of the DIP switches, refer to the Mounting Instructions M3191 [3].

RDG160KN

Applications with DC 0...10 V (ECM) fan control (Y50) or without fan:

The type of valve actuator control outputs can be changed from DC 0...10 V (factory setting) to On/Off.

To select On/Off valve actuator control, set parameters P46 and/or P47 = 1.

Cooling: DC 0...10 V Y10 (P46 = 2, default), On/Off on Q1 (P46 = 1)

Heating: DC 0...10 V Y20 (P47 = 2, default), On/Off on Q2 (P47 = 1)

- Notes:
- For applications with 3-speed fan, only DC 0...10 V control outputs Y10, Y20 are available.
 - Type of fan can be selected via P53 or DIP switch 4, see section 3.8.
 - On/Off valve actuator control on applications without fan function – sequence of settings:
 - Set DIP 4 to Off and P53 = 3.
 - Disable the fan function via parameter P52 = 0
 - Set valve actuators to On/Off via P46 and/or P47 = 1
 - For commissioning via tool, all DIP switches have to be set to OFF. Control outputs need to be set via tool in this case.

3.8 Fan control

Overview fan outputs

Different fan output signals are available depending on the thermostat type:

Control output Product no.	On/off 1- / 3-speed fan	Modulating fan DC 0...10 V	Control type selected via
RDG100KN	Q1, Q2, Q3 (3)		P53
RDG160KN	Q1, Q2, Q3 (3) ¹⁾	Y50 (1) ¹⁾	P53, DIP 4

() Number of outputs

1) Selectable via P53 or DIP switch 4 on RDG160KN

The fan operates in automatic mode or at the selected speed with manual mode. In automatic mode, the fan speed depends on the setpoint and the current room temperature. When the room temperature reaches the setpoint, the control valve closes and the fan switches off or stays at fan speed 1 (min. fan speed) according to the setting of parameters P15 (RDG160KN: fan stage in dead zone) and P60 (fan kick).

Factory setting for "Fan in the dead zone":

- RDG100KN: Fan speed 1: (P60 = 0)
- RDG160KN: Fan speed OFF: (P15 = 0, P60 = OFF)

Only one fan output at a time is on, either Q1, Q2 or Q3.

Selection fan output on RDG160KN

The type of the fan output (DC 0...10 V, 3-speed or single-speed) can be set via DIP switch 4, local HMI (P53) or tool (ACS, ETS).

If application is set via DIP switches and DIP 4 = Off :

- DC 0...10 V fan (ECM) on Y50 is selected
- Parameter P53 = 3 (ECM fan) can not be modified
- 3- / 1-speed fan output is not selectable

If application is set via DIP switches and DIP 4 = On

- 3-speed fan on Q1, Q2, Q3 is selected, parameter P53 = 2
- 1-speed fan (on Q1) can be selected via HMI (P53 = 1) or via tool (ACS, ETS)
- DC 0...10 V (ECM) fan output is not selectable
- 3-speed fan output is enabled only if the application has also been selected via DIP switches

If all DIP switches are Off (commissioning via tool ACS, ETS):

- Application and type of fan have to be set and downloaded via tool
- If ECM fan has been set, the type of fan output can not be modified via HMI
- If 3-speed or 1-speed has been selected, parameter P53 can be modified locally to P53 = 2 (3-speed) or P53 = 1 (1-speed)

The fan speed and mode can be changed via bus.

For this purpose, the fan command value needs to be enabled.



Fan command value
Enable fan command
value

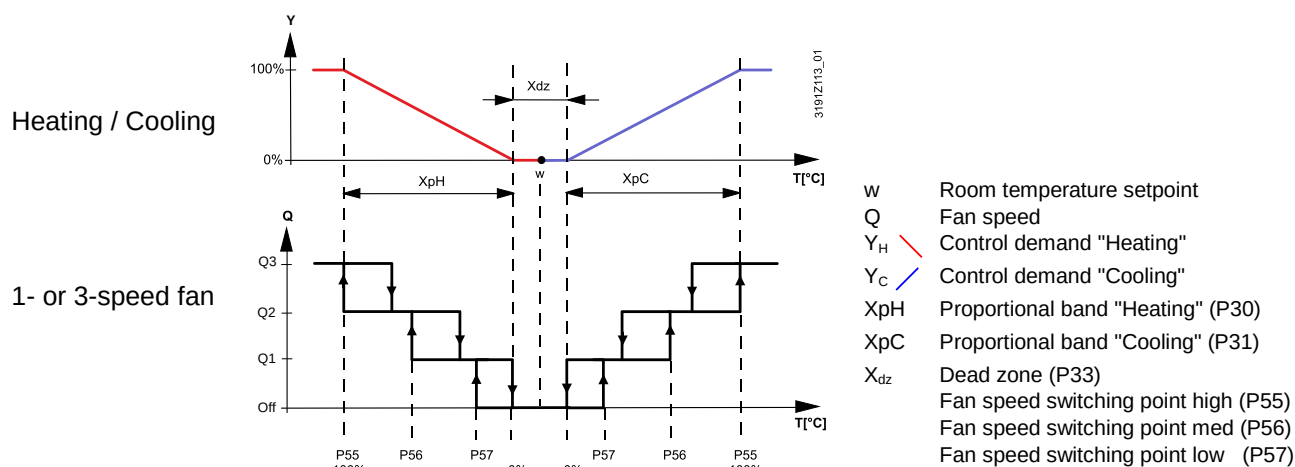


Fan operation
Fan stage 1-2-3
Fan output

The fan speed and mode can be monitored via bus.

3-speed fan control with modulating heating / cooling control (PWM, 3-pos or DC 0...10 V)

The individual switching points for **ON** of each fan stage can be adjusted via control parameters P55...P57. The fan speed switch off point is 20% below the switch on point. The diagrams below show fan speed control for modulating PI control.

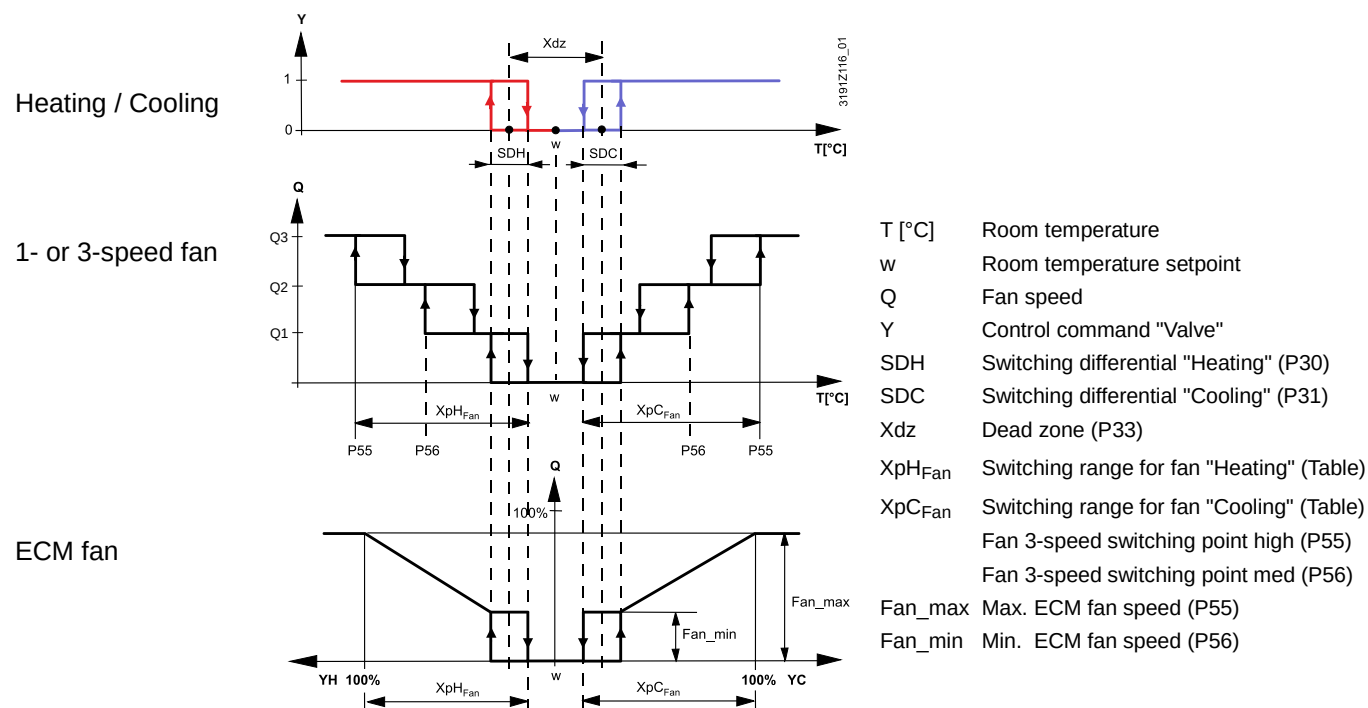


Note: The diagram only shows the PI control's proportional part.

3-speed / ECM fan control with On/Off heating / cooling control

On applications with 2-position control:

- 1) The switching point for low fan speed is synchronized to the heating / cooling output. Parameter "Switching point fan speed low" P57 is not relevant.
- 2) The maximum switching range of the fan ($X_{pH_{Fan}} / X_{pC_{Fan}}$) is defined by the switching differential (SDH/SDC) via a look-up table.



Look-up table with On/Off control

SDH/SDC [K]	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	>4.5
$X_{pH_{Fan}}/X_{pC_{Fan}}$ [K]	2	3	4	5	6	7	8	9	10

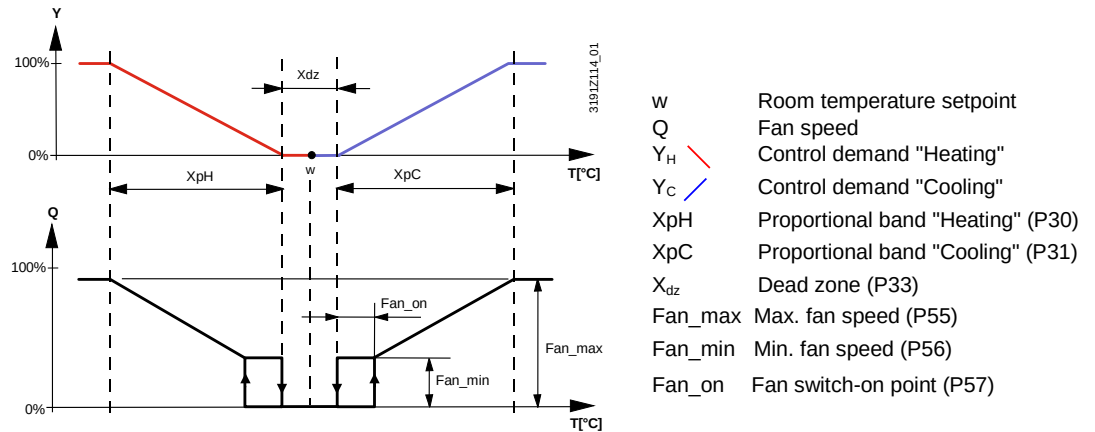
1-speed / 3-speed fan

The thermostat can control a 1- or 3-speed fan (selected via control parameter P53). A 1-speed fan is connected to terminal Q1, a 3-speed fan to terminals Q1, Q2 and Q3.

Control sequence for DC 0...10 V fan (ECM) and DC 0...10 V valves (RDG160KN)

When DC 0...10 V Fan and DC 0...10 V valve output control are selected, the fan switching points can be set via the following parameters:

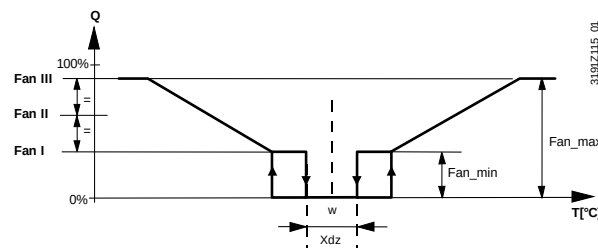
- P55: ECM fan max. output
- P56: ECM fan min. output
- P57: Switching point fan



Note The diagram only shows the PI control's proportional part.

Manual operation DC 0...10 V fan

Fan speed 1 = Min. fan speed
Fan speed 2 = half-way between Min. fan speed and Max. fan speed
Fan speed 3 = Max. fan speed



Note: The control signals "Heating" and "Cooling" are not influenced by the manual setting of fan speeds.

2 sequences heating / cooling

For heating or cooling with 2 sequences (e.g. heating with a heating coil and an electric heater, or 2-stage cooling), the fan is always synchronized with the first sequence.

Fan operation as per heating / cooling mode, or disabled

Fan operation can be limited to be active with cooling only or heating only, or even be totally disabled via control parameter "Fan operation" P52.

When fan operation is disabled, the fan symbol on the display disappears and pressing the fan button has no impact.

This function allows you to use the thermostat on universal applications such as chilled / heated ceilings and radiator, etc. (see section 3.6.9).

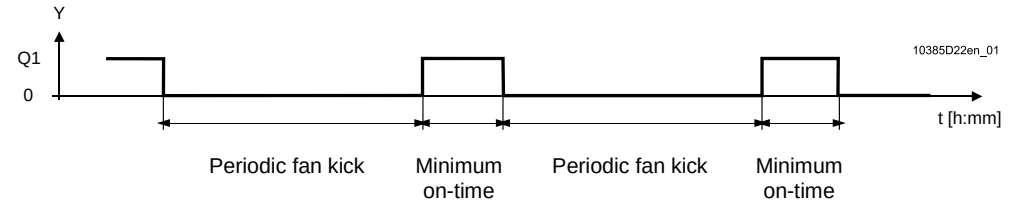
Fan minimum on- time

In automatic mode, a dwelling time of 2 minutes (factory setting) is active. The fan maintains each speed for at least 2 minutes before it changes to the next speed. This minimum on-time can be adjusted from 1...6 minutes via parameter P59.

Fan kick P60, P61

In automatic fan mode and with the room temperature in the dead zone, the control valve is normally closed and the fan disabled. With the "Fan kick" function, the fan can be released from time to time at low speed for minimum on-time (see above) even if the valve is closed.

This function can be used to avoid damage from moisture due to a lack of air circulation, or to allow a return air temperature sensor to acquire the correct room temperature.



The periodic fan kick time can be selected individually for Comfort mode via parameter P60, and for Economy mode via parameter P61.

Note: Fan kick value "0" means the fan runs continuously in the dead zone.
Fan kick value 1 and higher: value in minutes
Fan kick value "OFF" means the fan does not run in the dead zone.

Fan operation in dead zone P15 (RDG160KN)

Via parameter P15 in "Service Level", the fan speed in the dead zone (in Comfort mode) can be set according to customer preference.

The following options are available:

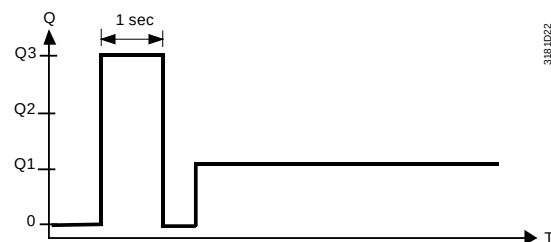
- Fan does not run in the dead zone (P15=0),
- Fan runs at low speed in Heating and Cooling mode (P15=1)
- Fan runs at low speed in Cooling mode only (P15=2)

The functions "Fan in dead zone" (P15) and "Fan kick" (P60) are combined as follows:

- P60 = 0 Fan runs continuously in the dead zone, P15 has no influence
- P60 = OFF Fan operation in dead zone according to P15

Fan start

When the fan starts from standstill, it starts at speed 3 for 1 second to ensure safe fan motor start by overcoming inertia and friction (selected via parameter P58).



Fan overrun for electric heater

When the electric heater is switched off, the fan overruns for 60 seconds (parameter P54) to avoid overtemperature of the electric heater or prevent the thermal cutout from responding.



Fan failure

In case of fan failure, the thermostat cannot protect the electric heater against overtemperature. For this reason, the electric heater must feature a separate safety device (thermal cutout).

Clean fan filter reminder



Fault information

The "Clean fan filter reminder" function counts the fan operating hours and displays message "FIL  " to remind the user to change / clean the fan filter as soon as the threshold is reached. This does not impact the thermostat's operation, which continues to run normally. The function is set via parameter P62 (default = Off (0)).

The "Clean filter reminder" is reset when the operating mode is manually set to Protection and back.

Fan in Auto Timer mode

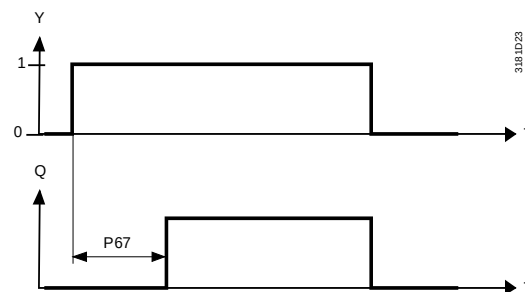
In Auto Timer mode , the default fan mode is automatic. The fan mode can be changed to Manual by pressing the FAN button. The fan returns to the automatic default mode after each switchover from Comfort to Economy mode, and vice versa.

Fan start delay

To let the heating / cooling coil reach its temperature, the fan start can be delayed by a time period set via parameter P67.

RDG100KN SW version <= 1.24:

Function available for 2-position control outputs only.



3.9 Multifunctional input, digital input

The thermostat has 2 multifunctional inputs X1 and X2 and a digital input D1. An NTC type sensor like the QAH11.1 (AI, analog input) or a switch (DI, digital input) can be connected to the input terminals. The functionality of the inputs can be configured via parameters P38 + P39 for X1, P40 + P41 for X2, and P42 + P43 for D1.



The current temperature or state of the inputs X1/X2 and D1 is available on bus for monitoring purposes.

The parameters can be set to the following values:

#	Function of input	Description	Type X1/X2	Type DI
0	Not used	No function.	--	--
1	External / return air temperature	Sensor input for external room temperature sensor or return air temperature sensor to acquire the current room temperature, or floor heating temperature sensor to limit the heating output. <i>Note:</i> The room temperature is acquired by the built-in sensor if the floor temperature limitation function is enabled via parameter P51.	AI	--
2	Heating / cooling changeover	Sensor input for "Automatic heating / cooling changeover" function. A switch can also be connected rather than a sensor. Important: Switch closed means always cooling, (this cannot be changed), see section 3.5. Heating / cooling changeover is also possible via bus. In this case, the function must not be assigned to any local input X1, X2, D1. See also section 3.5. Diagnostic value 0 °C is displayed for closed contact / 100 °C for open contact, if a switch is connected.	AI / DI	DI
3	Operating mode switchover	Digital input to switch over the operating mode to Economy. If the operating mode switchover contact is active, user operations are ineffective and "OFF" is displayed. Operating mode switchover is also possible via bus. In this case, the function must not be assigned to any local input X1, X2, D1. See also section 3.2.	DI	DI
4	Dew point monitor	Digital input for a dew point sensor to detect condensation. Cooling is stopped if condensation occurs.	DI	DI
5	Enable electric heater	Digital input to enable / disable the electric heater via remote control. Enable electric heater is also possible via bus. In this case, the function must not be assigned to any local input X1, X2, D1. See also section 3.6.	DI	DI





Fault
information



D1, X1, X2
(Digital)



X1, X2
(Temp.)



X1, X2
(Temp.)

#	Function of input	Description	Type X1/X2	Type DI
6	Fault	Digital input to signal an external fault (example: dirty air filter). If the input is active, "ALx" is displayed and a fault is sent on the bus. See also section 3.11.8. (Alarm x, with x = 1 for X1, x = 2 for X2, x = 3 for D1). <i>Note:</i> Fault displays have no impact on the thermostat's operation. They merely represent a visual signal.	DI	DI
7	Monitor input (Digital)	Digital input to monitor the state of an external switch via bus.	DI	DI
8	Monitor input (Temperature)	Sensor input to monitor the state of an external sensor (e.g. QAH11.1) via bus.	AI	--
9	Supply air temperature limitation (RDG160KN only)	Sensor input to acquire the supply air temperature. The thermostat controls the room temperature via the built-in sensor. The control output (DC 0...10 V) is reduced if the supply air temperature exceeds the min / max limits (P63, P64).	AI	--

- Operational action can be changed between normally open (NO) and normally closed (NC) via parameter P39, P41 (or P43 if it is a digital input).
- Each input X1, X2 or D1 must be configured with a different function (1...5).
Exception: 1, 2 or 3 inputs can be configured as fault (6) or monitor input (7,8).
- X1 is factory-set to "External sensor" (1), X2 to "Not used" (0), and D1 to "Operating mode switchover" (3).

For more detailed information, refer to section 3.4 "Applications".

Installation note:

- For inputs X1, X2, or D1, one physical switch can be used for up to 20 thermostats (parallel connection).
Caution! DO NOT mix X1 / X2 (mains potential on RDG100KN) and D1.
- For sensors on inputs X1, X2, or D1, the cable length is max. 80 m.

3.10 Handling faults

Temperature out of range

When the room temperature is outside the measuring range, i.e. above 49 °C or below 0 °C, the limiting temperatures blink, e.g. "0 °C" or "49 °C".
In addition, the heating output is activated if the current setpoint is not set to "OFF", the thermostat is in heating mode and the temperature is below 0 °C.
For all other cases, no output is activated.

The thermostat resumes Comfort mode after the temperature returns to within the measuring range.

Fault "Er1" on display

When the built-in sensor fails and no external sensor is connected, the thermostat shows the fault message "Er1" on the display. The thermostat needs to be replaced if the room temperature needs to be measured with the built-in sensor.



For fault status messages on the bus, see section 3.11.8.

3.11 KNX communications

The RDG KNX thermostats support communications as per the KNX specification.

S-mode Standard mode; engineering via group addresses.

LTE mode Logical Tag Extended mode, for easy engineering, is used in conjunction with Synco.

3.11.1 S-mode

This mode corresponds to KNX communications.
Connections are established via ETS by assigning communication objects to group addresses.

3.11.2 LTE mode

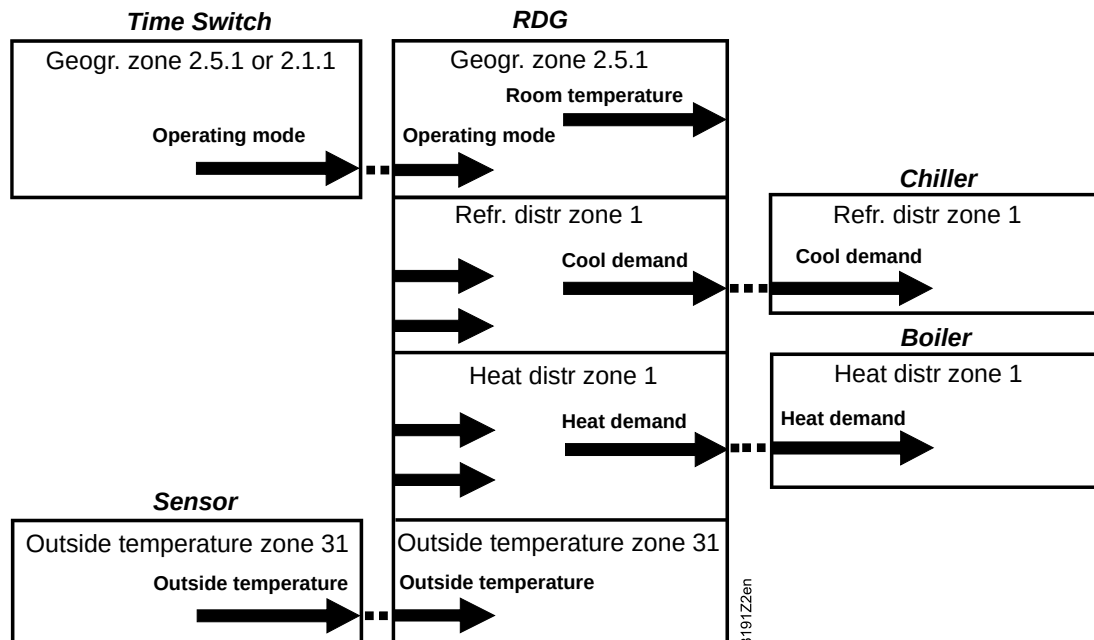
LTE mode was specifically designed to simplify engineering. Unlike with S-mode, there is no need to create the individual connections (group addresses) in the tool. The devices autonomously establish connections.

Definitions

To make this possible, the following circumstances are predefined:

- Every device or subdevice is located within a zone
- Every data point (input or output) is assigned to a zone
- Every data point (input or output) has a precisely defined "name"

Whenever an output and an input with the same "name" are located in the same zone, a connection is established automatically, as shown in the following diagram.



Engineering and commissioning

- For a detailed description of KNX (topology, bus supply, function and setting of LTE zones, filter tables, etc.), see "Communication via the KNX bus for Synco 700, 900 and RXB/RXL, Basic Documentation" [6].
- LTE mode data points and settings are described in the Synco Application Manual [12].
- To engineer and commission a specific system, use the Synco700 planning and commissioning protocol (XLS table in HIT, [7]).

3.11.3 Zone addressing in LTE mode (in conjunction with Synco)

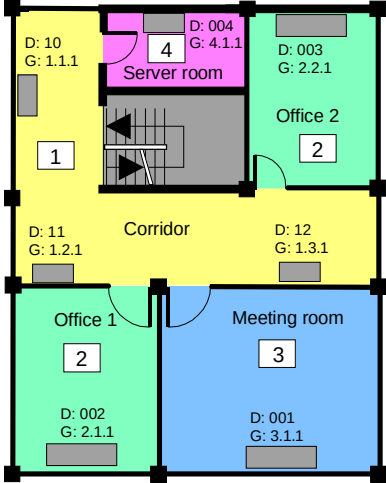
In cases where RDG KNX room thermostats are used in LTE mode (e.g. in conjunction with Synco), zone addresses need to be allocated. The following zone address must be defined together with the Synco devices at the planning stage depending on the application.

Short description	Factory setting	Parameter
Geographical zone (apartment)	--- (out of service)	P82
Geographical zone (room)	1	P83
Heat distr zone heating coil	1	P84
Refr distr zone cooling coil	1	P85
Heat distr zone heating surface	2	P86

Note: "Subzone" of "Geographical zone" is fix 1 (not adjustable)

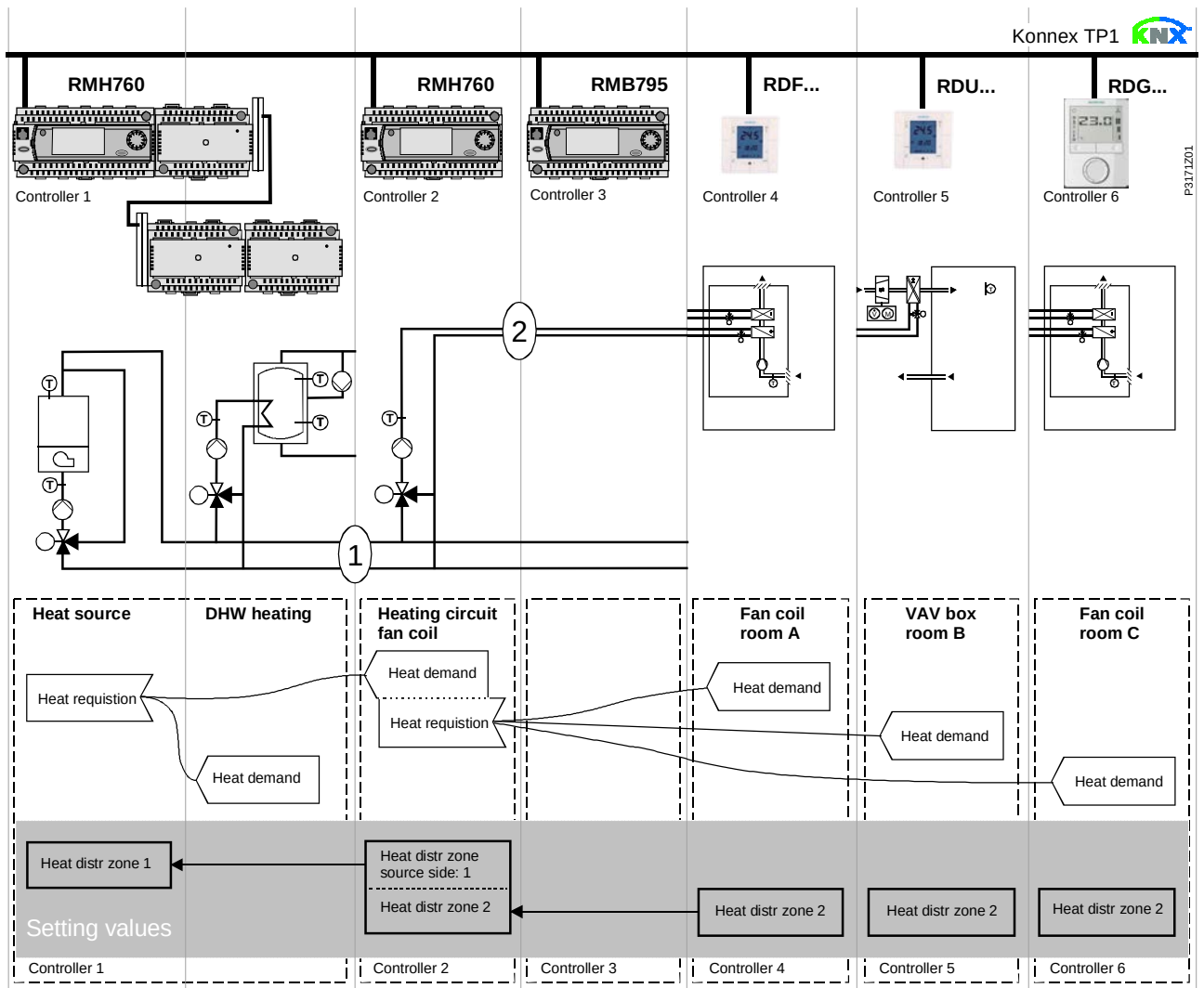
The device will send and receive LTE communication signals only if the zone address is valid (not OSV = out of service).

The zones to be defined are as follows:

Geographical zone (space zone) (Apartment . Room . Subzone) Apartment = ---, 1...126 Room = ---, 1...63 Subzone = fix 1	Zone in which an RDG KNX thermostat is physically located. Other room-specific devices may also be located in this zone. Information exchanged in this zone is related specifically to the device like operating mode, setpoints, room temperature, etc. The designations "Apartment", "Room" and "Subzone" do not need to be taken literally. For example, Apartment can be used to refer to a group of rooms, floor or section of a building. "Room", however, really does refer to a room. Subzone is not used for HVAC devices. It is more relevant to other disciplines, such as lighting. Subzone is fix at "1" and not visible. The time switch information is expected from the same zone where the thermostat is located (Residential). If no time switch information is received from the same zone, the thermostat will use the information received from the same apartment but with room "1" A.1.1 (Office).
	Example: Commercial building In a commercial building, the time switch information is sent by the RMB975 central control unit. The zones are divided in so called "Room groups" (e.g. 1...4), where each "Room group" can have an individual schedule. A room thermostat in the same "Room group" need to have the same Apartment Address. Legend: D = device address (P81) G = geographical zone (P82, P83) (Apartment.Room.Subzone) 
Heat distribution zone heating coil Zone = ---, 1...31	Information related specifically to the hot water system in heating coils is exchanged within this zone. The zone also includes a Synco device to process the information (e.g. RMH7xx or RMU7xx with changeover).
Heat distribution zone heating surface (radiator) Zone = ---, 1...31	Information related specifically to the hot water system of a radiator is exchanged within this zone (e.g. heating demand). This zone also includes a Synco device to process the information (e.g. RMH7xx or RMB795).
Refrigeration distribution zone cooling coil Zone = ---, 1...31	Information related specifically to the chilled water system is exchanged within this zone (e.g. cooling demand). This zone also includes a Synco device to process the information (e.g. RMU7xx).
Outside temperature zone Zone = fix 1 (SW < V1.20) = fix 31 (SW >= V1.20)	Outside temperature received in outside temperature zone 31 will be / can be displayed on the room thermostat when commissioned accordingly (parameter P07 = 2). With SW < V1.20: Zone = 1.

3.11.4 Example of heating and cooling demand zone

The building is equipped with Synco controls on the generation side and RDF / RDG thermostats on the room side.



Explanation relating to the illustration

In the case of a typical application, the individual RDF / RDG room thermostats send their heat demand to the primary controller (in the above example to the RMH760).

(1) and (2) designate the numbers of the distribution zone.

- Notes:
- This type of application can analogously be applied to refrigeration distribution zones.
 - If no 2-pipe fan coil is used, heat and refrigeration demand signals are sent simultaneously to the primary plant.

3.11.5 Send heartbeat and receive timeout

In a KNX network, S-mode and LTE mode communication objects can be exchanged between individual devices. The *Receive timeout* defines the period of time within which all the communication objects requested from a device must have been received at least once. If a communication object is not received within this period, a predefined value is used.

Similarly, the *Send heartbeat* defines the period of time within which all the communication objects requested must be transmitted at least once.

LTE mode / S-mode

Fixed times are specified as follows:

- Receive timeout: 31 minutes
- Send heartbeat: 15 minutes

Reducing the bus load

Individual zones can also be disabled (out of service) via control parameter if they are not being used. In disabled zones, the LTE signal will no longer be periodically sent, and will therefore reduce bus load.

3.11.6 Startup

Startup response

The application is restarted after every reset, so that all the connected motorized valve actuators are synchronized (see "Control outputs", 3.7).

Startup delay

After a reset, it takes up to 5 minutes for all the connected room thermostats to restart. This is designed to avoid overloading the mains power supply when restarting. At the same time, it reduces the load on the KNX network, as not all thermostats transmit data at the same time. The delay ($T_{\text{WaitDevice}}$) is determined by the thermostat's device address. After the delay, the device starts to send.



Heating output primary
Heating output secondary
Cooling output primary
Cooling output secondary

3.11.7 Heating and cooling demand

In conjunction with Synco, the heating and/or cooling demand from each room is transmitted to the BACS to provide the required heating or cooling energy.

An example for LTE mode is described in section 3.11.4.

In S-mode, the current state signals of the control outputs are available.

3.11.8 Fault function on KNX

If a fault occurs (e.g. digital fault input, dew point, communication configuration, etc.) then a fault will be sent on the bus.

An RDG thermostat listens on the bus and sends its fault when the fault has the highest alarm priority. This ensures that the management station does not miss any alarms.

If alarms occur at the same time, the alarm with the highest priority will be first displayed and sent on the bus.



Fault transmission is different in LTE mode and S-mode:

S-mode	LTE mode
Fault state	Alarm info (error code + internal information)
Fault information (internal information)	Alarm text (default text can be edited with ACS tool)

The table below shows the error code and default alarm texts.

Prio	Fault	Thermostat	Fault information on bus		
		Display	Error code	Default fault text	Text adjustable *)
-	No fault	---	0	No fault	✓
1	Bus power supply**)	🔔 BUS BUSF	5000	No bus power supply	---
2	Device address error	🔔 Addr	6001	>1 id device address	---
3	Condensation	🔔 💧	4930	Condensation in the room	✓
4	External fault input X1	🔔 AL1	9001	Fault input 1	✓
5	External fault input X2	🔔 AL2	9002	Fault input 2	✓
6	External fault input D1	🔔 AL3	9003	Fault input 3	✓
7	Clean filter reminder	🔔 FIL	3911	Dirty filter	✓

*) Default alarm texts are stored in the thermostat's non-volatile memory and can be adjusted using the ACS commissioning tool

**) This error will not be sent on bus (because there is no bus, not enough bus power supply, bus is overloaded or bus signal is distorted)

Priority of alarms

- Priority order is #1...7
- External faults #4...6: If faults are active, the display will show AL1, AL2, AL3, alternating. On the bus, only the fault with the highest priority will be sent



Fault transmission

A supervisor alarm system may command the thermostat to stop sending faults to the bus via the communication object "Fault transmission" (disable / enable). This has no impact on the local display of faults.

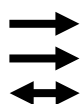
After a timeout of 48 hours, the sending of faults will automatically be enabled again.

3.12 Communication objects (S-mode)

3.12.1 Overview



Page	Object # and name	Thermostat	Object # and name	Page
		RDG		
13	1 System time	→		
13	3 Time of day	→		
13	44 Outside temperature	→	→ 21 Room temperature	13
			→ 16 Room operating mode: State 1)	14
15	12 Room operating mode: Time switch 1)	→	→ 24 Room temperature: Current setpoint	23
15	7 Room operating mode: Preselection 1)	↔		
14, 16, 58	20 Room operating mode: Window state	→	→ 33 Fan operation (0 = Auto / 1 = Manual)	53
			→ 35 Fan output	53
23	22 Room temperature: Comfort basic setpoint	→	→ 36 Fan stage 1	53
23	23 Room temperature: Comfort setpoint	↔	→ 37 Fan stage 2	53
			→ 38 Fan stage 3	53
33	31 Application mode	→	→ 25 Heating output primary 2)	64
53	32 Enable fan command value	→	→ 26 Heating output secondary 2)	64
53	34 Fan command value	→	→ 27 Cooling output primary 2)	64
			→ 28 Cooling output secondary 2)	64
36, 58	29 Enable electric heater	→	→ 43 D1	59
28, 58	30 Heating/cooling changeover	→	→ 39/40 X1 (temperature / digital)	59
			→ 41/42 X2 (temperature / digital)	59
65	6 Fault transmission	→	→ 5 Fault state	31, 65
			→ 4 Fault information	31, 57, 59, 65



- Input communication object
- ⇨ Output communication object
- ↔ Input & output communication object
- 1) 8-bit and 1-bit object available, selectable via parameter in ETS
- 2) Availability depending on selected application / function

3.12.2 Description of communication objects

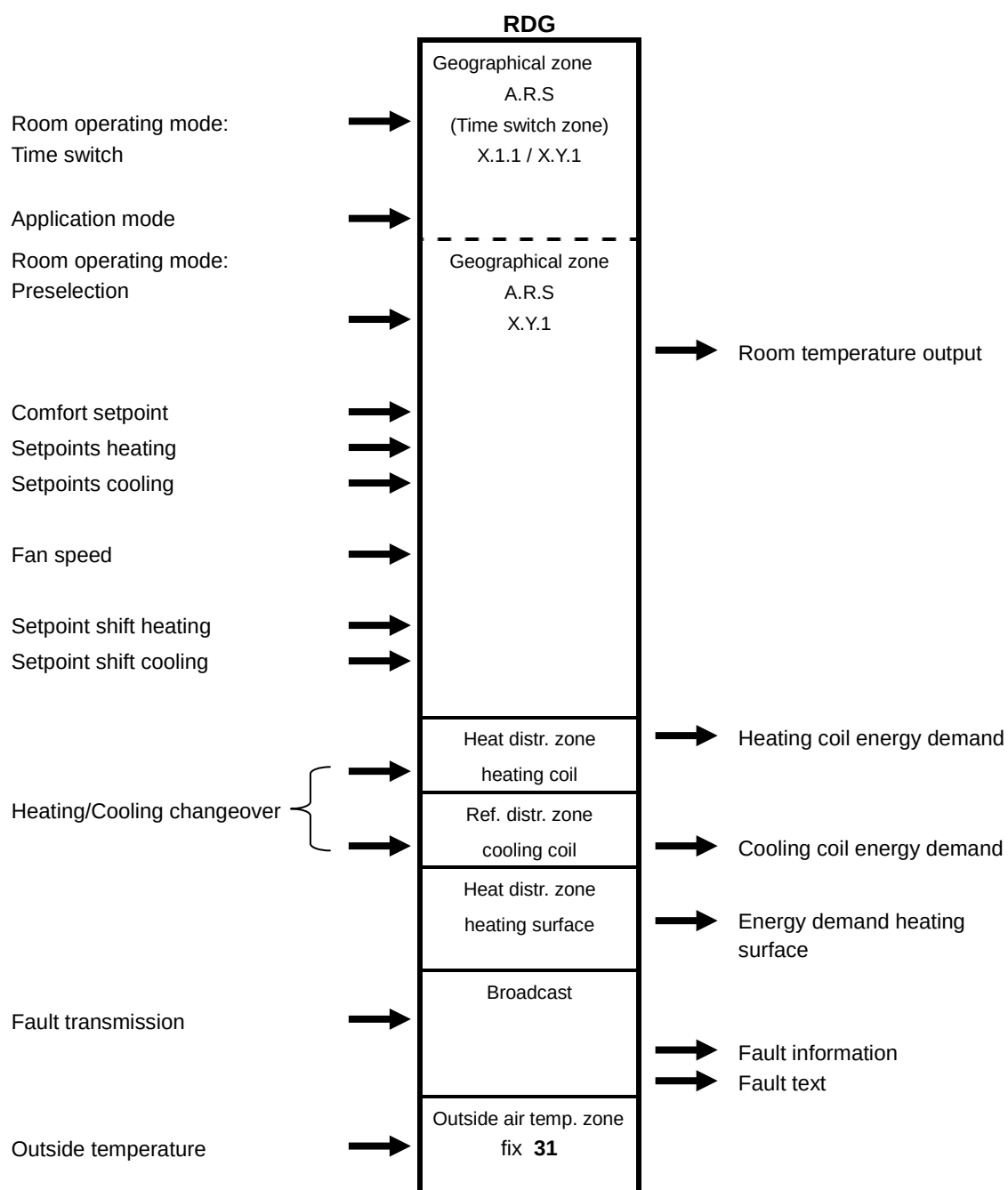
Obj	Object name	Function	Type/ length	Flags
1	System time	Time and date	19.001 8 Byte	CWU
System time for display on the room thermostat. See parameter P07 (3 or 4)				
3	Time of day	Time and date	10.001 3 Byte	CWU
Another object for receiving the time of day for display on the room thermostat. See parameter P07 (3 or 4)				
4	Fault information	Alarm Info	219.001 6 Byte	CT
Common alarm output. If an alarm occurs, the alarm number is transmitted				
5	Fault state	Faulty / normal	1.005 1 bit	CT
Common alarm output. If an alarm occurs, the alarm flag is set				
6	Fault transmission	Enable / disable	1.003 1 bit	CWU
A supervisor alarm system can disable the broadcasting of alarms by the devices. This has no impact on the local display of alarms. After a timeout of 48 hours, the sending of faults will automatically be enabled again.				
7	Room operating mode: Preselection	Auto Comfort PreComf. Economy Protection	20.102 1 Byte	CWTU
Controls the room operating mode selection of the thermostat via bus. The command can also be submitted as four 1-bit communication objects (8...11). The last interaction wins – either from local operating mode button or via bus. Note: The thermostat will transform Precomfort either into Economy or Comfort (selectable via P88).				
8 9 10 11	Operating mode: Preselection Auto Comf Eco Prot	Trigger	1.017 1 bit	CW
Switch room operating mode to either Auto, Comfort, Economy or Protection. The last interaction wins – either from the local operating mode button or via bus.				
12	Room operating mode: Time switch	Comfort Economy PreComf. Protection	20.102 1 Byte	CWU
This information is provided by a central time switch or a supervisor and defines the actual HVAC operating mode. The command can also be submitted via three 1-bit communication objects (13...15). Protection has the highest priority and cannot be overridden. Note: The thermostat will transform Precomfort either into Economy or Comfort (selectable P88).				
13 14 15	Time switch Comfort Economy Protection	Trigger	1.017 1 bit	CW
Switch the HVAC mode to either Comfort, Economy or Protection mode.				

Obj	Object name	Function	Type/ length	Flags
16	Room operating mode: State	Comfort Economy Protection	20.102 1 Byte	CRT
Effective room operating mode used by the thermostat (considering time switch, user selection, window contact, etc.) This state information is available via one 8-bit enumeration or three 1-bit communication objects (17...19). Note: The thermostat does not support Precomfort.				
17 18 19	Room operating mode: State State Comfort State Economy State Protection	ON OFF	1.002 1 bit	CT
Corresponding communication object sends "True"				
20	Window state	Open Closed	1.019 1 bit	CWU
The thermostat is set to Economy mode if value "1" (open) is received. It switches back to the previous mode when the value is "0" (closed). "Window state" is sent e.g. by a KNX switch or a KNX presence detector. It has the same effect as the local operating mode switchover contact X1, X2, D1 (parameter P38, P40, P42). <i>Only one input source must be used, either local input X1/X2/D1 or KNX bus.</i>				
21	Room temperature	Temp. value	9.001 2 Bytes	CRT
The value of the room temperature measured via built-in or external sensor is available via this communication object.				
22	Room temperature: Comfort basic setpoint	Temp. value	9.001 2 Bytes	CWU
If function "Temporary setpoint" is enabled via parameter P69, then after an operating mode change, the setpoint adjustments made by the user and via communication object 23 will be dismissed and the thermostat will be reset to the Comfort basic setpoint. Note: Setpoints that have been changed via the local HMI may be overwritten during a system startup from a central master controller, e.g. RMB795. <i>The Comfort basic setpoint is stored in EEPROM (see section 3.3.2). → The service life of the EEPROM depends on the number of write cycles. Never write this communication object cyclically!</i>				
23	Room temperature: Comfort setpoint	Temp. value	9.001 2 Bytes	CWTU
Communication object used to shift the setpoint used by the thermostat (see section 3.3.2). Same priority as local setpoint shift on the thermostat. The last intervention wins. Note: The Comfort basic setpoint (object 22) will not be changed.				
24	Current setpoint	Temp. value	9.001 2 Bytes	CRT
Current setpoint, including shift, compensation, etc., used by the thermostat for temperature control.				
25	Heating output primary	0...100 %	5.001 8 bit	CRT
Indicates the position of the heating actuator of first stage. E.g. 2-pipe with electric heater application: Output of heating coil.				
26	Heating output secondary	0...100%	5.001 8 bit	CRT
Indicates the position of the heating actuator of the second stage. E.g. 2-pipe with electric heater application: Output of the electric heater.				

Obj	Object name	Function	Type/ length	Flags
27	Cooling output primary	0...100%	5.001 8 bit	CRT
Indicates the position of the cooling actuator of the first stage. E.g. 2-pipe with electric heater application: Output of the cooling coil.				
28	Cooling output secondary	0...100%	5.001 8 bit	CRT
Indicates the position of the cooling actuator of the second stage. E.g. 2-stage changeover application: Output of the second cooling stage.				
29	Enable electric heating	Enable / disable	1.003 1 bit	CWU
An electric heater can be disabled with this communication object (e.g. to meet tariff regulations). The same function is also available via local multifunctional input X1/X2/D1 (parameter P38, P40, P42). <i>Only one input source must be used, either local input X1/X2/D1 or KNX bus.</i>				
30	Heating / cooling changeover	Heat / Cool	1.100 1 bit	CWU
Changeover information transmitted via bus. Default: Current mode before power down. The same function is also available via local multifunctional input X1/X2/D1 (parameter P38, P40, P42). <i>Only one input source must be used, either local input X1/X2/D1 or KNX bus..</i>				
31	Application mode	HVAC control mode	20.105 8 bit	CWU
0	Auto (default)	Heating and/or cooling		
1	Heat	Heating only		
2	Morning warmup*	Heating only		
3	Cool	Cooling only		
5	Precool*	Cooling only		
6	OFF	Neither heating nor cooling		
8	Emergency heat*	Heating only		
9	Fan only	Fan runs at high speed		
* Function handled like Heat (1) or Cool (3)				
32	Enable fan command value	Enable Disable	1.003 1 bit	CWU
Set fan mode to Auto (disable) or Manual (enable) by a KNX control unit. If Manual, the value received on <i>Fan command value (34)</i> will be used to command the fan speed. Default: Enable The last interaction wins – either from the local fan mode button or via bus.				

Obj	Object name	Function	Type/ length	Flags
33	Fan operation	Auto / Manual	1.001 1 bit	CRT
Indicates the status of the fan mode: Auto (0) or Manual (1).				
34	Fan command value	0...100%	5.001 8 bit	CWU
The fan can be set to a specified speed by a KNX control unit when manual fan operation is enabled.				
Speed		Fan command value (physical KNX value)		
1		1...33%	(1...85)	
2		34...67%	(86...170)	
3		68...100%	(171...255)	
Fan speed "0" is not supported by the thermostat and the fan speed will remain unchanged.				
35	Fan output	0...100%	5.001 8 bit	CRT
Indicates the current fan speed as a value 0...100%				
Speed		Fan output (physical KNX value)		
OFF		0%	(0)	
1		33%	(84)	
2		66%	(186)	
3		100%	(255)	
36	Fan speed 1	ON / OFF	1.001 1 bit	CRT
37	Fan speed 2			
38	Fan speed 3			
Indicate the state of the relay outputs				
39	X1: Temperature	Temp. value	9.001 2 Byte	CRT
40	X2: Temperature			
Indicate the values of the temperature sensors connected to the local inputs X1 / X2				
41	X1: Digital	ON / OFF	1.001 1 bit	CRT
42	X2: Digital			
43	D1: Digital			
Indicate the status of the digital inputs (adjusted by parameters P39/P41/P43) including considering of operating action				
44	Outside temperature	Temp. value	9.001 2 Byte	CWU
The outside temperature measured by a KNX sensor can be displayed on the thermostat, if parameter P07 "Additional user information" is set = 2 (outside temperature).				

3.13 Communication objects (LTE-mode)



3.14 Control parameters

A number of control parameters can be readjusted to optimize control performance. This can be done on the thermostat via HMI or via commissioning / operating tool. These parameters can also be set during operation without opening the unit. In the event of a power failure, all control parameter settings are retained.

The control parameters are assigned to 2 levels:

- "Service level", and
- "Expert level" including communications, diagnostics and test

The "Service level" contains a small set of parameters to set up the thermostat for the HVAC system and to adjust the user interface. These parameters can be adjusted any time.

Change parameters at the "Expert level" carefully, as they impact the thermostat's control performance and functionality.

3.14.1 Parameter setting via local HMI

Enter only "Service level"

1. Press left and right button simultaneously for 4 seconds.
Release and press the right button again within 2 seconds until the display shows "P01".
Continue with step 2.

Enter "Expert level" and "Diagnostics & test"

1. Press left button and right button simultaneously for 4 seconds.
Release and press the left button again within 2 seconds until the temperature disappears.
Turn the rotary knob counterclockwise min. ½ rotation.
The display shows "Pxx".
Continue with step 2.

Adjust parameters

2. Select the required parameter by turning the rotary knob.
3. Press button ✓ (OK); the current value of the selected parameter starts blinking and can be changed by turning the rotary knob.
4. Press button ✓ (OK) to confirm the adjusted value or press button ↵ (Esc) to cancel the change.
5. If you wish to adjust additional parameters, repeat steps 2...4.
6. Press button ↵ (Esc) to leave the parameter setting mode.

Reset parameters

The factory setting for the control parameters can be reloaded via parameter P71, by changing the value to "ON". Confirm by pressing the right button. The display shows "8888" during reloading.

3.14.2 Parameter setting / download via tool

Control parameters can be adjusted via bus either by parameter download during commissioning or during normal operation with a tool like ACS.



ACS

With the ACS tool, the parameters can be changed...

- during commissioning via parameter download (all parameters)
- during normal operation via Popcard (most of the parameters)

**OZW772 Web server,
RMZ792 bus operator
unit**

Most parameters can be changed during normal operation using the OZW772 web server or the RMZ792 bus operator unit.



ETS

ETS is an engineering tool and can be used for the full commissioning of the RDG KNX thermostats. Device address, application, and control parameters can be defined and downloaded via ETS.

Notes

- Setting RDG KNX parameters is only supported by ETS4 or higher / ACS version 5.11 or higher.
- The RDG KNX thermostats (without ETS parameter download) require version ETS3f or higher / ACS version 5.11 or higher.

Connecting a KNX tool

Connecting a KNX commissioning / operating tool to the RDG is described in section 4.2.

3.14.3 Parameters of the "Service level"

Parameter	Name	Factory setting	Range	RDG100KN	RDG160KN	Dependencies
	Service level					
P01	Control sequence	2-pipe: 1 = Cooling only 4-pipe: 4 = Heating and Cooling	0 = Heating only 1 = Cooling only 2 = H/C changeover manual 3 = H/C changeover auto 4 = Heating and Cooling	✓	✓	
P02	Operation via room op selector	1	1 = Auto – Protection 2 = Auto - Comfort - Economy - Protection	✓	✓	P01
P03	Operation via fan op selector	0	0 = Auto - Manual 1 = Manual 2 = Auto - Manual - Protection	✓	✓	P52
P04	Unit	C (0)	C = ° Celsius F = ° Fahrenheit	✓	✓	
P05	Measured value correction	0 K	– 3 ... 3 K	✓	✓	
P06	Standard display	0	0 = Room temperature 1 = Setpoint	✓	✓	
P07	Additional display information	0	0 = --- (No display) 1 = °C and °F 2 = Outside temperature (via bus) 3 = Time of day (12h) (via bus) 4 = Time of day (24h) (via bus)	✓	✓	
P08	Comfort basic setpoint	21 °C	5 ... 40 °C	✓	✓	
P09	Comfort setpoint minimum	5 °C	5 ... 40 °C	✓	✓	
P10	Comfort setpoint maximum	35 °C	5 ... 40 °C	✓	✓	
P11	Economy heating setpoint	15 °C	OFF, 5 ... WCoolEco; WCoolEco = 40 °C max	✓	✓	
P12	Economy cooling setpoint	30 °C	OFF, WHeatEco ... 40 °C; WHeatEco = 5C min	✓	✓	
P13	Electric heater when cooling	ON	ON: Enabled OFF: Disabled	✓	✓	Appl
P14	Button lock	0	0 = Unlocked 1 = Auto lock 2 = Manual lock	✓	✓	
P15	Fan stage in dead zone (Comfort)	0	0 = Disabled 1 = Low speed (Heat and Cool) 2 = Low speed (Cooling only)	x	✓	

Note: Parameter display depends on selected application and function.

3.14.4 Parameters of the "Expert level with diagnostics and test"

Parameter	Name	Factory setting	Range	RDG100KN	RDG160KN	Dependencies
	Expert level					
P30	Heat P-band Xp / switching diff	2 K	0.5 ... 6 K	✓	✓	
P31	Cool P-band Xp / switching diff	1 K	0.5 ... 6 K	✓	✓	
P32	Radiator P-band Xp / swi diff	2 K	0.5 ... 6 K	✓	✓	Appl
P33	Dead zone Comfort mode	2 K	0.5 ... 5 K	✓	✓	Appl
P34	Setpoint differential	2 K	0.5 ... 5 K	✓	✓	Appl
P35	Integral action time Tn, RDG100KN RDG160KN	5 min 45 min	0...10 min 0...120 min	✓ x	x ✓	P46, P47 P46, P47
P36	H/C ch'over swi point cooling	16 °C	10...25 °C	✓	✓	P38, P40
P37	H/C ch'over swi point heating	28 °C	27...40 °C	✓	✓	P38, P40
P38	Input X1 RDG100KN (range 0..8) RDG160KN (range 0..9)	1: = Ext. sensor	0 = --- (no function) 1 = Room temp ext. sensor / Return air temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact (DI) 4 = Dew point sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital) 8 = Monitor input (Temp) 9 = Supply air sensor	✓	✓	
P39	Normal position input X1	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Close	✓	✓	P38
P40	Input X2 RDG100KN (range 0..8) RDG160KN (range 0..9)	0 = no function	0 = --- (no function) 1 = Room temp ext. sensor / Return air temp (AI) 2 = H/C changeover (AI/DI) 3 = Operating mode contact (DI) 4 = Dew point sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital) 8 = Monitor input (Temp) 9 = Supply air sensor	✓	✓	
P41	Normal position input X2	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Close	✓	✓	P40
P42	Input D1	3 = Op mode contact	0 = --- (no function) 2 = H/C changeover (DI) 3 = Operating mode contact (DI) 4 = Dew point sensor (DI) 5 = Enable electric heater (DI) 6 = Fault input (DI) 7 = Monitor input (Digital)	✓	✓	
P43	Normal position input D1	0 (N.O.)	0 = Normally open / Open 1 = Normally closed / Close	✓	✓	P42
P44	Actuator running time Y1/Y2	150 s	20...300 sec	✓	x	P46
P45	Actuator running time Y3/Y4	150 s	20...300 sec	✓	x	P47
P45	Power of electric heater on Q2 (for adaptive temperature compensation)	0 kW	0.0 1.2 kW	x	✓	
P46	Output Y1/Y2	On/Off (1)	0 = 3-position 1 = On/Off 2 = PWM	✓	x	Appl
P46	Outputs Y10 (DC) or Q1 (2-pos)	2 = DC 0...10 V	1 = On/Off 2 = DC 0...10 V	x	✓	Appl
P47	Output Y3/Y4	On/Off (1)	0 = 3-position 1 = On/Off 2 = PWM	✓	x	Appl
P47	Outputs Y20 (DC) or Q2 (2.pos)	2 = DC 0...10 V	1 = On/Off 2 = DC 0...10 V	x	✓	Appl
P48	On time minimum 2-pos output	1 min.	1...20 min	✓	✓	P46

Parameter	Name	Factory setting	Range	RDG100KN	RDG160KN	Dependen- cies
	Expert level					
P49	Off time minimum 2-pos output	1 min.	1...20 min	✓	✓	P47
P50	Purge time	OFF	OFF: Not active 1...5 min: Active with selected duration	✓	✓	P38, P40
P51	Flow temp limit floor heating	OFF	OFF, 10...50 °C	✓	✓	P38, P40
P52	Fan control	1 = Enabled	0 = Disabled 1 = Enabled 2 = Heating only 3 = Cooling only	✓	✓	
P53	Fan speeds RDG100KN	2 = 3-speed	1 = 1-speed 2 = 3-speed	✓	x	P52
P53	Fan speeds RDG160KN	3 = DC 0...10 V	1 = 1-speed fan 2 = 3-speed fan 3 = DC 0...10 V (ECM fan)	x	✓	P52
P54	Fan overrun time	60 sec	0...360 sec	✓	✓	P52, Appl
P55	Fan speed switching point high	100%	80...100%	✓	✓	P52, P53, DIP
	ECM fan max. output	ECM: 80%	ECM: fan min...100%	x	✓	P52, P53, DIP
P56	Fan speed switching point med	65%	30...75%	✓	✓	P52, P53, DIP
	ECM fan min. output	ECM: 30%	ECM: 1%...fan max.	x	✓	P52, P53, DIP
P57	Fan speed switching point low	10%	1...15%	✓	✓	P52, P53, DIP
	ECM: Switching point fan	ECM:10%	ECM: 1...100%	x	✓	P52, P53, DIP
P58	Fan start kick	ON	ON: Enabled OFF: Disabled	✓	✓	P52
P59	On time minimum fan	2 min	1...6 min	✓	✓	P52
P60	Periodic fan kick Comfort RDG100KN RDG160KN	0 OFF	0...89 min, OFF	✓	✓	P52
P61	Periodic fan kick Eco	OFF	0...359 min, OFF	✓	✓	P52
P62	Service filter	OFF	Off, 100...9900 h	✓	✓	P52
P63	Minimum supply air temperature	OFF	OFF, 0...P64 °C	x	✓	P38, P40
P64	Maximum supply air temperature	OFF	OFF, P63 ... 50°C	x	✓	P38, P40
P65	Protection heating setpoint	8 °C	OFF, 5...WCoolProt; WCoolProt = 40 °C max	✓	✓	
P66	Protection cooling setpoint	OFF	OFF, WHeatProt... 40; WHeatProt = 5°C min	✓	✓	
P67	Fan start delay RDG100KN RDG160KN	0 s	0...180 s 0...360 s	✓	✓	P52, P46, P47
P68	Temporary Comfort mode	0 (= OFF)	0...360 min	✓	✓	P02
P69	Temporary Comfort setpoint	OFF	OFF = Disabled ON = Enabled	✓	✓	
P71	Restore factory setting	OFF	OFF = Disabled ON = Reload start "8888" is displayed for 3s during reload process	✓	✓	
P74	Output Q3 function	0	0 = No function 1= Switch OFF in Protection	x	✓	

Note: P45: To compensate for heat dissipation of the el. heater relay in RDG160KN.
P46, P47: Setting to 2-position or 3-position is made with DIP switches 4 and 5.

Parameter	Name	Factory setting	Range	Dependencies
	Communications			
P81	Device address 1)	255	1...255	
P82	Geographical zone (apartment) 2)	---	---, 1...126	
P83	Geographical zone (room) 2)	1	---, 1...63	
P84	Heat distr zone heating coil	---	---, 1...31	Appl, P01
P85	Refrig distr zone cooling coil	---	---, 1...31	Appl, P01
P86	Heat distr zone heating surface	---	---, 1...31	Appl
P88	Transformation Precomfort	0	0 = Economy 1 = Comfort	

- 1) Physical address = Area.Line.DeviceAddress. Factory setting of Area = 0, Line = 2.
Can be changed by special management service e.g. from line coupler or via ACS commissioning tool.
- 2) Type = geographical zone A.R.S. In RDG sub zone = fixed value 1.

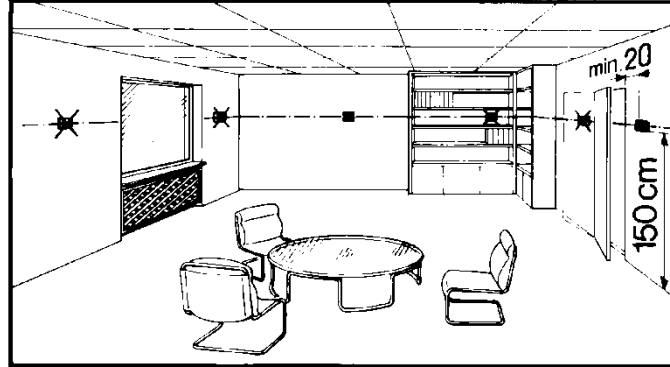
Parameter	Name	Range	Dependencies
	Diagnostics & test		
d01	Application number	0 = (No application) 1 = 2-pipe 2 = 2-pipe with electric heater 3 = 2-pipe with radiator 4 = 4-pipe 5 = 2-stage heating or cooling 6 = 4-pipe with electric heater	
d02	X1 state	"---" = function not selected 0 = Not activated (for DI) 1 = Activated (DI) 0...49 °C = Current temp. value (for AI) 00  = H/C Input shorted 100  = H/C Input open	
d03	X2 state	"---" = function not selected 0 = Not activated (for DI) 1 = Activated (DI) 0...49 °C = Current temp. value (for AI) 00  = H/C Input shorted 100  = H/C Input open	
d04	D1 state	"---" = function not selected 0 = Not activated (for DI) 1 = Activated (DI) 00  = H/C Input shorted 100  = H/C Input open	
d05	Test mode for checking the Y1/Y2 actuator's running direction 3)	"---" = no signal on outputs Y1 and Y2 OPE = output Y1 forced opening CLO = output Y2 forced closing	P46
d06	Test mode for checking the Y3/Y4 actuator's running direction 3)	"---" = no signal on outputs Y3 and Y4 OPE = output Y3 forced opening CLO = output Y4 forced closing	P47
d07	Software version	Ux.xx is displayed	
d10	Test mode for checking the Q3 output (P74 function) (RDG160KN)	"---" = no signal at output Q3 OPE = output Q3 forced opening CLO = output Q3 forced closing	P74, App

- 3) This parameter can only be quit when the setting is back at "---".
Press the left button to escape.

4. Handling

4.1 Mounting and installation

Do not mount on a wall in niches or bookshelves, behind curtains, above or near heat sources, or exposed to direct solar radiation. Mount about 1.5 m above the floor.



Mounting



- Mount the room thermostat in a clean, dry indoor place without direct airflow from a heating / cooling device, and not exposed to dripping or splash water.

Wiring

See Mounting Instructions M3191 [3] enclosed with the thermostat.



- Comply with local regulations to wire, protection and earth the thermostat.
- The device has no internal fuse for supply lines to fan and actuators. To avoid risk of fire and injury due to short-circuits, the AC 230 V mains supply line must have a circuit breaker with a rated current of no more than 10 A.



- Properly size the cables to the thermostat, fan and valve actuators for AC 230 V mains voltage.



- Use only valve actuators rated for AC 230 V.



- The wiring cross section used for power supply (L, N), fan (Q1, Q2, Q3, N) and 230 V outputs (Yx - N) must be adapted to the preceding overload protection elements (10A) under all circumstances. Comply under all circumstances with local regulations.



- Isolate the cables of input D1-GND for 230 V if the conduit box carries AC 230 V mains voltage.
- Inputs X1-M, X2-M or D1-GND: Several switches (e.g. summer / winter switch) may be connected in parallel. Consider overall maximum contact sensing current for switch rating.
- Inputs X1-M and X2-M carry mains potential (RDG100KN only). Sensor cables must be suited for AC 230 V mains voltage.



- Selectable relay function (RDG160KN): see section 3.14.4.
- Isolate the cables of KNX communication input CE+ / CE- for AC 230 V if the conduit box carries AC 230 V mains voltage.



- No cables provided with a metal sheath.
- Disconnect from supply before removing from the mounting plate.
- When a KNX bus power supply is connected on the line with communicating thermostats and Synco controller, the internal KNX power supply of the Synco controllers must be switched off.

4.2 Commissioning

Applications

The room thermostats are delivered with a fixed set of applications.

Select and activate the relevant application during commissioning using one of the following tools:

- Local DIP switch and HMI
- Synco ACS
- ETS

DIP switches

Set the DIP switches before snapping the thermostat to the mounting plate, if you want to select an application via **DIP switches**.

All DIP switches need to be set to "OFF" (remote configuration), if you want to select an application via **commissioning tool**.

After power is applied, the thermostat resets and all LCD segments flash, indicating that the reset was correct. After the reset, which takes about 3 seconds, the thermostat is ready for commissioning by qualified HVAC staff.

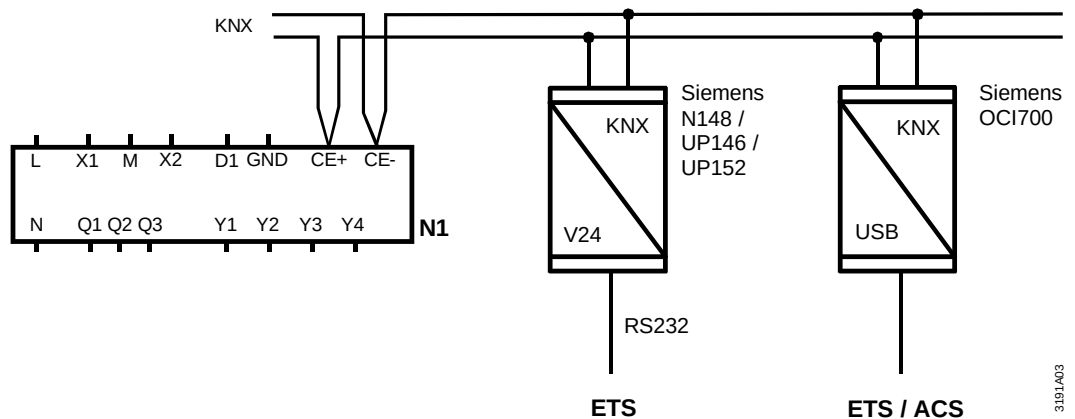
NO APPL

If all DIP switches are OFF, the display reads "**NO APPL**" to indicate that application commissioning via a tool is required.

Note: Each time the application is changed, the thermostat reloads the factory setting for all control parameters, except for KNX device and zone addresses!

Connect tool

Connect the Synco ACS or ETS tools to the KNX bus cable at any point for commissioning:



ACS and ETS require an interface:

- RS232 KNX interface (e.g. Siemens N148 / UP146 / UP152)
- OCI700.1 USB-KNX interface

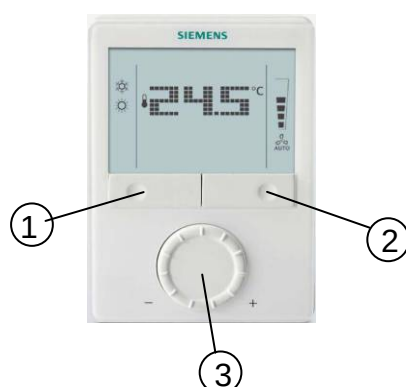
Note: An external KNX bus power supply is required if an RDG...KN is connected directly to a tool (ACS or ETS) via KNX interface.

Control parameters	The thermostat's control parameters can be set to ensure optimum performance of the entire system. The parameters can be adjusted using – Local HMI – Synco ACS – ETS The control parameters of the thermostat can be set to ensure optimum performance of the entire system (see section 3.14, control parameters).						
Control sequence	• The control sequence may need to be set via parameter P01 depending on the application. The factory setting is as follows: <table> <tr> <th>Application</th><th>Factory setting P01</th></tr> <tr> <td>2-pipe and chilled / heated ceiling, and 2-stage</td><td>1 = cooling only</td></tr> <tr> <td>4-pipe, chilled ceiling and radiator</td><td>4 = heating and cooling</td></tr> </table>	Application	Factory setting P01	2-pipe and chilled / heated ceiling, and 2-stage	1 = cooling only	4-pipe, chilled ceiling and radiator	4 = heating and cooling
Application	Factory setting P01						
2-pipe and chilled / heated ceiling, and 2-stage	1 = cooling only						
4-pipe, chilled ceiling and radiator	4 = heating and cooling						
Calibrate sensor	• Recalibrate the temperature sensor if the room temperature displayed on the thermostat does not match the room temperature measured (after min. 1 hour of operation). To do this, change parameter P05.						
Setpoint and range limitation	• We recommend to review the setpoints and setpoint ranges (parameters P08...P12) and change them as needed to achieve maximum comfort and save energy.						
Programming mode	The programming mode helps identify the thermostat in the KNX network during commissioning. Press left and right buttons simultaneously for 6 seconds to activate programming mode, which is indicated on the display with "PrO9". Programming mode remains active until thermostat identification is complete.						
Assign KNX device address	Assign device address (P81) via HMI, ACS or ETS. With device address set to 255, the communication is deactivated (no exchange of process data).						
Assign KNX group addresses	Use ETS to assign the KNX group addresses of the thermostat's communication objects.						
KNX serial number	Each device has a unique KNX serial number at the rear. An additional sticker with the same KNX serial number is enclosed in the packaging box. This sticker is intended for installers for documentation purposes.						

4.3 Operation

See also Operating Instructions B3191 [2] enclosed with the thermostat.

Layout

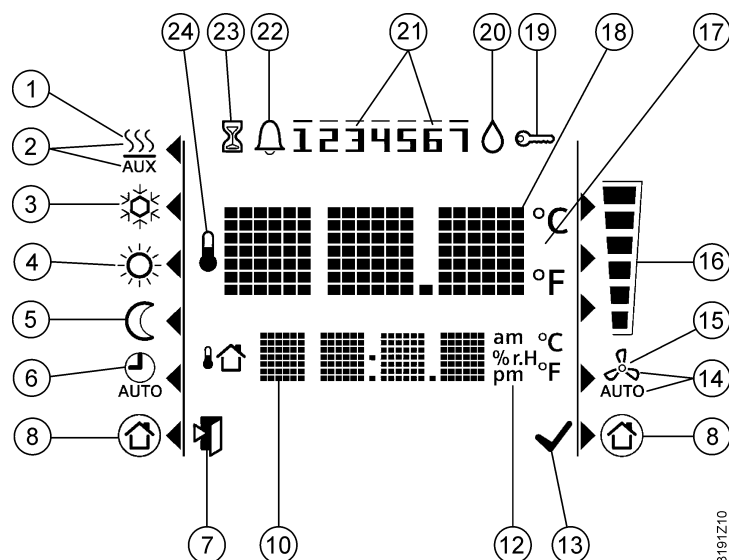


1. Operating mode selector / Esc
2. Fan mode selector / Ok
3. Rotary knob to adjust setpoints and parameters

Button operation

User action	Effect, description
Normal operation	Actual operating mode and state are indicated by symbols.
Press any button (thermostat in normal operation)	Enter operating mode selection; backlit LCD turns on, all possible mode symbols turn on, indicator element (arrow) will appear on the current mode / state.
Press left button	Change operating mode (indicator element (arrow) changes to the next mode symbol. After the last press and a timeout of 3 seconds, the newly selected mode is confirmed, the other elements disappear. After a timeout of 20 seconds, the LCD backlight turns off.
Press left button (P01 = 2)	Toggle between heating and cooling.
Press left button while "Operating mode" via bus is Economy or while operating mode switchover contact is activated	Activate "Extend Comfort mode" (for details, see page 17).
Keep left button depressed and turn rotary knob clockwise / counter-clockwise	Activate timer "Extend presence" / "Extend absence" and set the time (for details, see page 17).
Press right button >3 seconds	Activate / deactivate button lock.
Press right button for fan coil unit	Change fan mode.
Press right button if P52 = 0 (fan disabled, e.g. in chilled ceiling applications)	Set thermostat to Protection mode.
Turn rotary knob	Adjust the room temperature Comfort setpoint.
Press left and right button >3 seconds, release, then press right button >3 seconds	Enter parameter setting mode "Service level".
Press left and right button for 3 seconds, release, press left button for 3 seconds, then turn rotary knob counterclockwise min. ½ revolution	Enter parameter setting mode "Expert level", diagnostics and test.
Press left and right button simultaneously for 6 seconds	Enter (KNX) programming mode.

Display



#	Symbol	Description	#	Symbol	Description
1		Heating mode	14		Automatic fan
2		Heating mode, electric heater active	15		Manual fan
3		Cooling mode	16		Fan speed 1
4		Comfort			Fan speed 2
5		Economy			Fan speed 3
6		Auto Timer mode according to schedule (via bus)	17		Degrees Celsius Degrees Fahrenheit
8		Protection mode	18		Digits for room temperature and setpoint display
9		Escape	19		Button lock
10		Additional user information, like outside temperature or time of day from KNX bus. Selectable via parameters	20		Condensation in room (dew point sensor active)
12		Morning: 12-hour format Afternoon: 12-hour format	21		Weekday 1...7 from KNX bus 1 = Monday / 7 = Sunday
13		Confirmation of parameters	22		Fault
			23		"Temporary timer" function; visible when operating mode is temporarily extended (extended presence or absence)
			24		Indicates that room temperature is displayed

4.4 Remote operation

The RDG thermostats can be operated from a remote location using an OZW772 web server, a RMZ792 bus operating unit or the ACS tool.

4.5 Disposal



The devices are considered electronics devices for disposal in terms of European Directive 2012/19/EU and may not be disposed of as domestic waste.

- Dispose of the device via the channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

5. Supported KNX tools

5.1 ETS



ETS

ETS is an engineering tool. It can be used for the full commissioning of the RDG KNX thermostats.

The following functions can be realized with ETS4:

- Define and download the physical address
- Define and download the application (plant type, control sequence)
- Set up and download the thermostat's control parameters
- Set up and download group addresses

This basic documentation does not describe how to operate ETS and commission a device. Refer to the KNX Manual for more details.



Note!

Setting RDG KNX parameters is only supported by ETS4 or higher. ETS4 can be updated online.

5.1.1 Parameter settings in ETS

For setting the parameters, open the project and select a device.

To start the parameter settings, select **Edit**, then **Edit parameters**.

Device: 0.0.5 RDG100KN Room Thermostat

[DIP] Plant type	4-pipe
[P01] Control Sequence	Heating and cooling
[P02] Operation via room op selector	Auto - Protection
[P04] Unit	Degrees Fahrenheit
[P06] Standard display	Room temperature
[P07] Additional display information	----
[P14] Keypad	Unlocked
[P68] Temporary comfort mode [minutes]	0

- Notes
- The ETS version 3f or higher can be used to assign the communication objects to group addresses (S-mode).
 - The ETS4 or higher can be used to download the application and parameters.

The **application** (plant type) and **Control Sequence** can be adjusted and downloaded.

Device: 0.0.5 RDG100KN Room Thermostat

[DIP] Plant type	4-pipe
[P01] Control Sequence	Heating and cooling

The **control parameters**, ([Pxx] description) can also be adjusted and downloaded. Refer to section 3.14.

5.2 ACS tool



ACS

With the ACS tool, the RDG KNX thermostats can be commissioned (physical address, application, parameters). They can be operated or monitored via bus during normal operation.

This Manual does not describe how the physical address is defined. Also, it only gives a brief overview of the main functionality of ACS.
For more information, refer to the ACS online help.



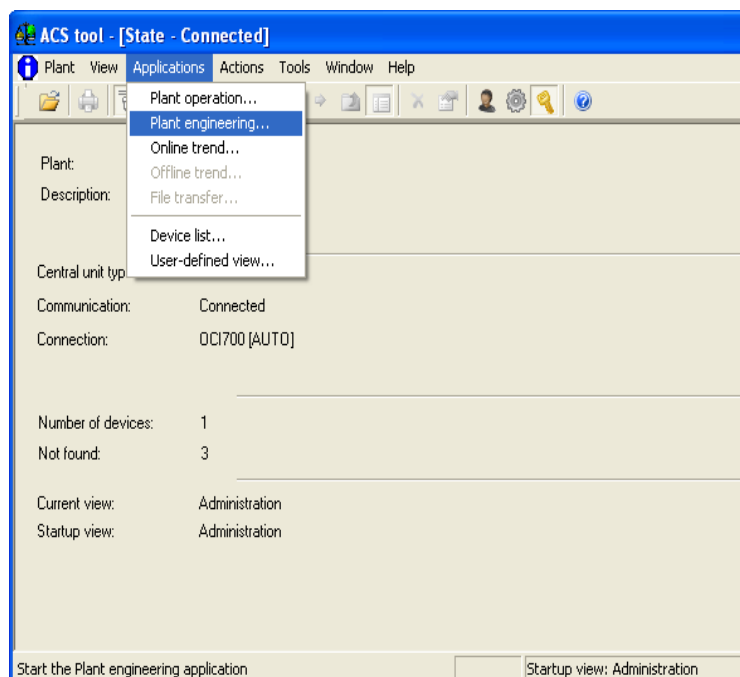
Note!

Setting RDG KNX parameters is only supported by ACS Version 5.11 or higher.

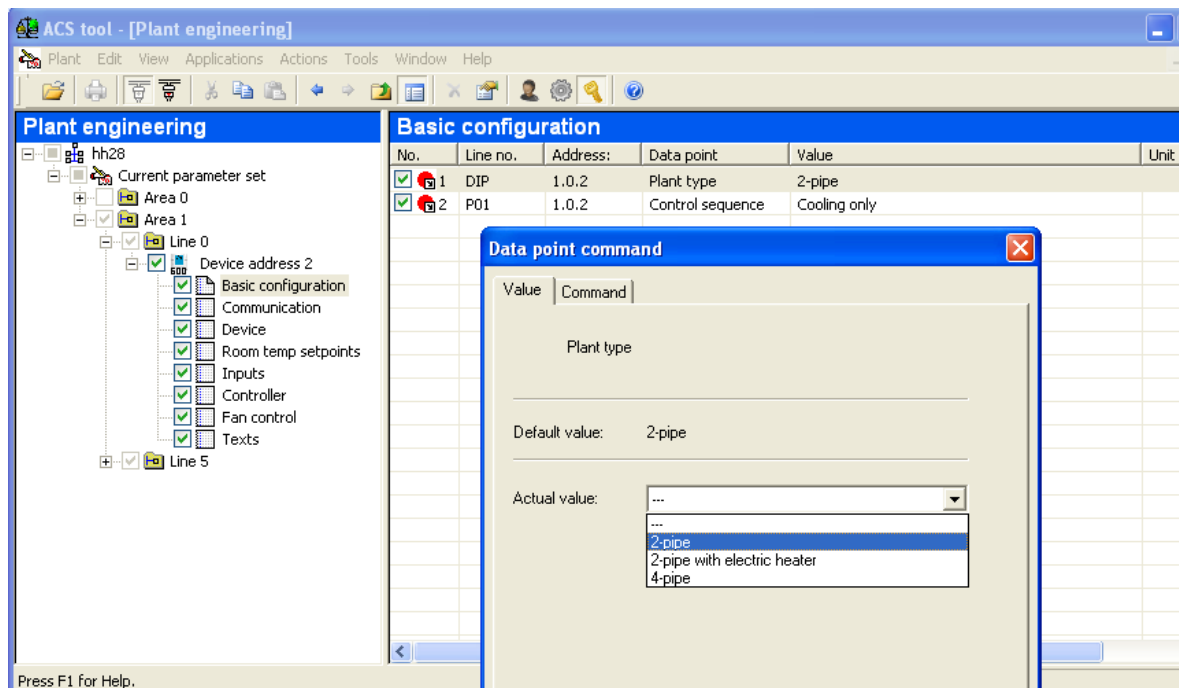
5.2.1 Parameter settings in ACS

In the **ACS** program, select **Plant**, then **Open** to open the plant.

To start the parameter settings, select **Applications**, then **Plant engineering...**:



The **application** and **control parameters** can be adjusted and downloaded.
 Column *Line no.* contains the parameter number as shown in the parameter table.
 Refer to section 3.14, control parameters.



Note!

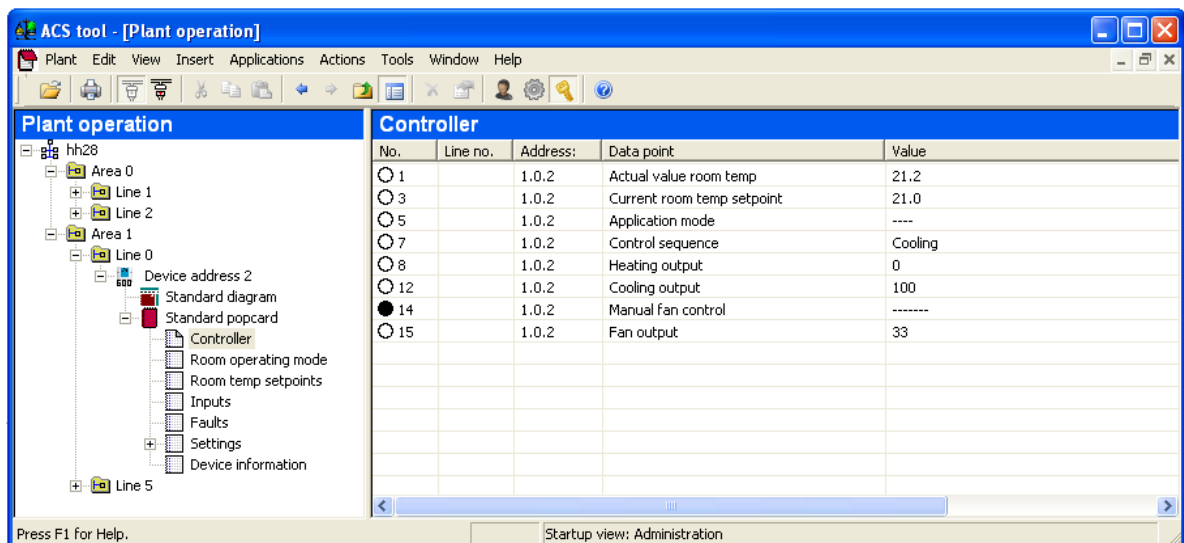
Some parameters have a different range in ACS than in the room thermostats.
 The thermostat does not accept changes that are outside its range. This can be observed online by the fact that a changed value jumps back to the original value.
 To be sure, use the ranges described in the parameter tables in section 3.14.

5.2.2 Operation and monitoring with ACS



ACS Operating

In the **ACS** program, select **Plant**, then **Open** to open the plant.
 To start monitoring and operation, select **Applications**, then **Plant operation**.

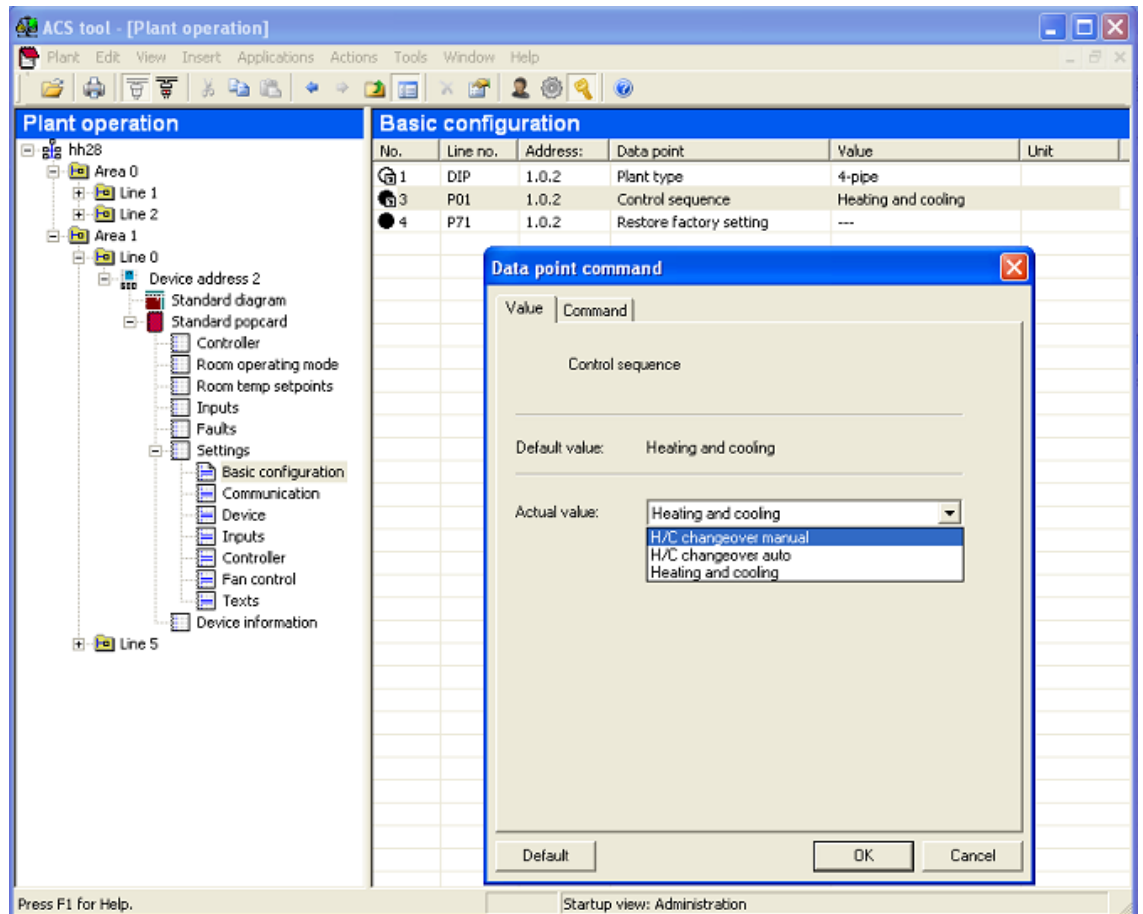


Parameter settings in
ACS

ACS supports parameter settings even during normal operation.

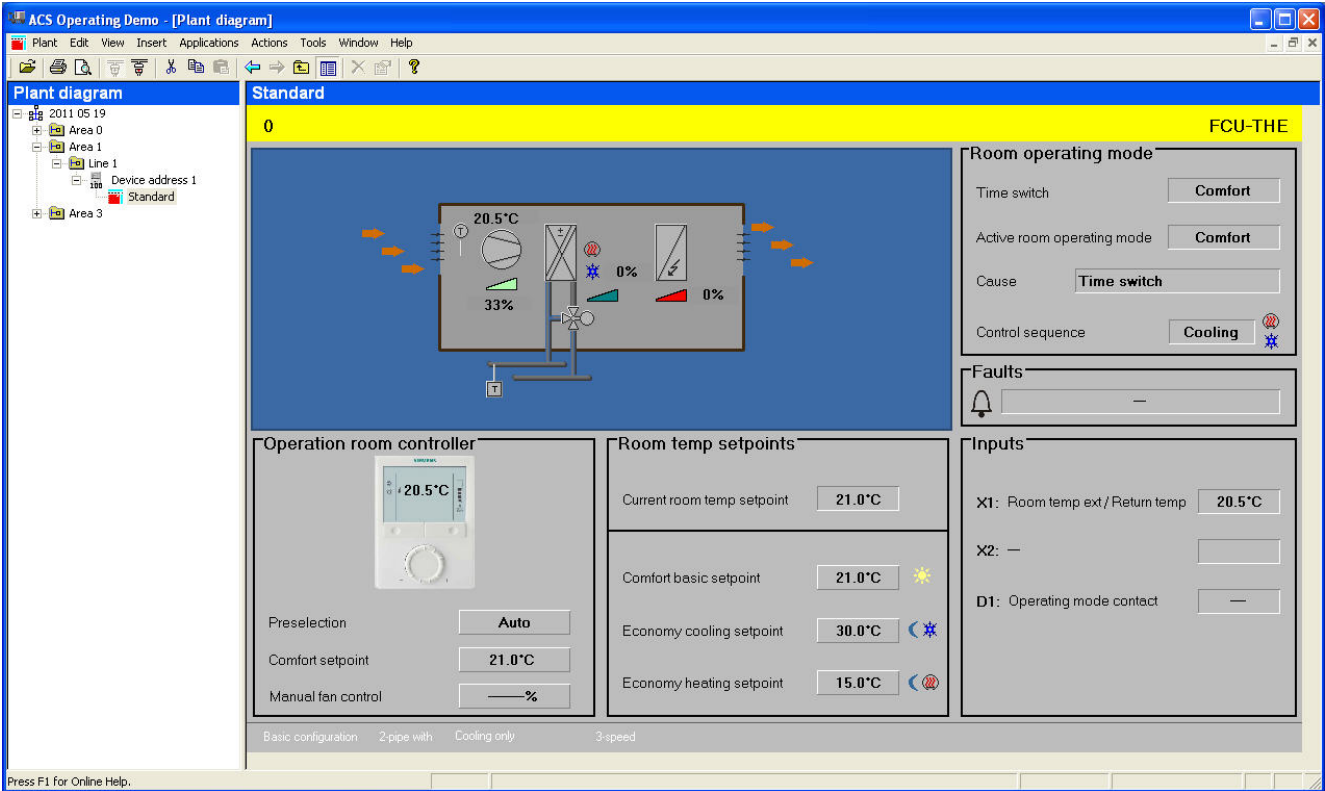
To change a control parameter, select **Popcard**, then **Settings**.

- Notes:
- Make sure you have logged on with sufficient access right.
 - Only control parameter can be changed, no application!

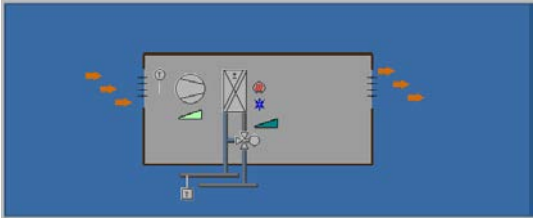
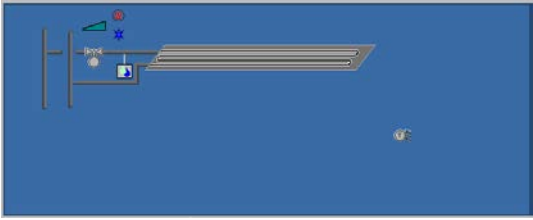
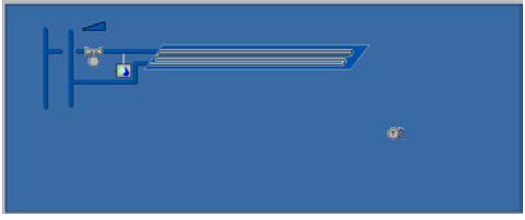


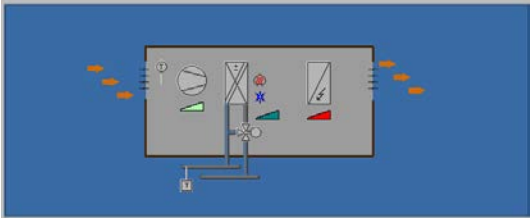
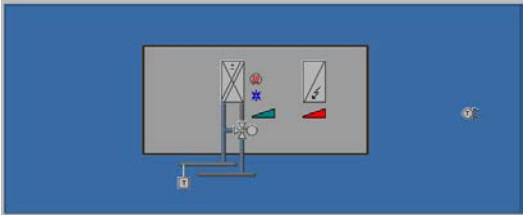
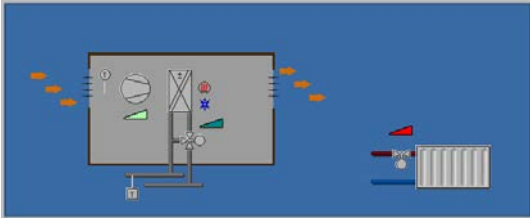
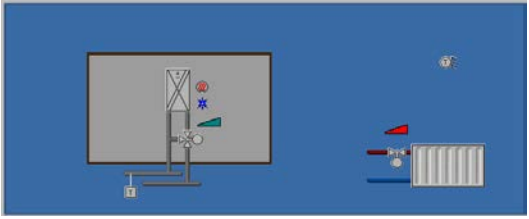
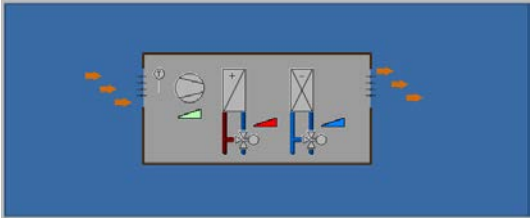
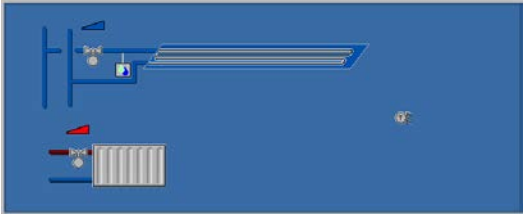
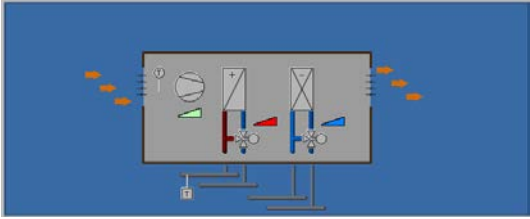
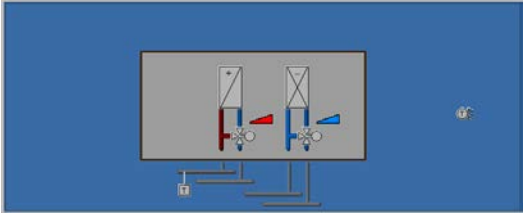
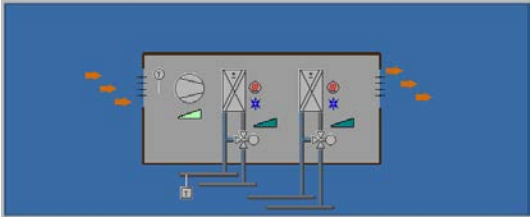
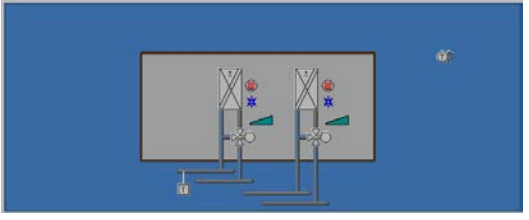
Plant diagram in ACS

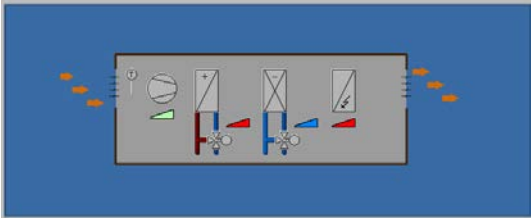
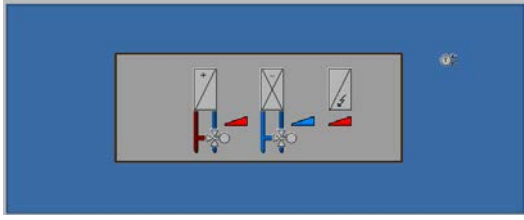
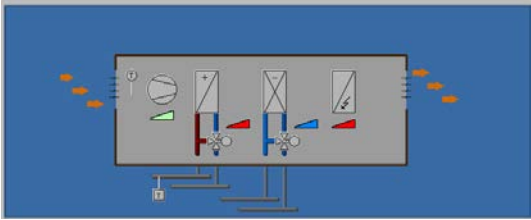
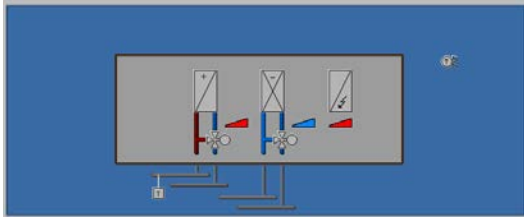
ACS offers plant diagrams for easy monitoring and operation of the thermostat.
To start this application, select **Applications**, then **Pant diagram**.



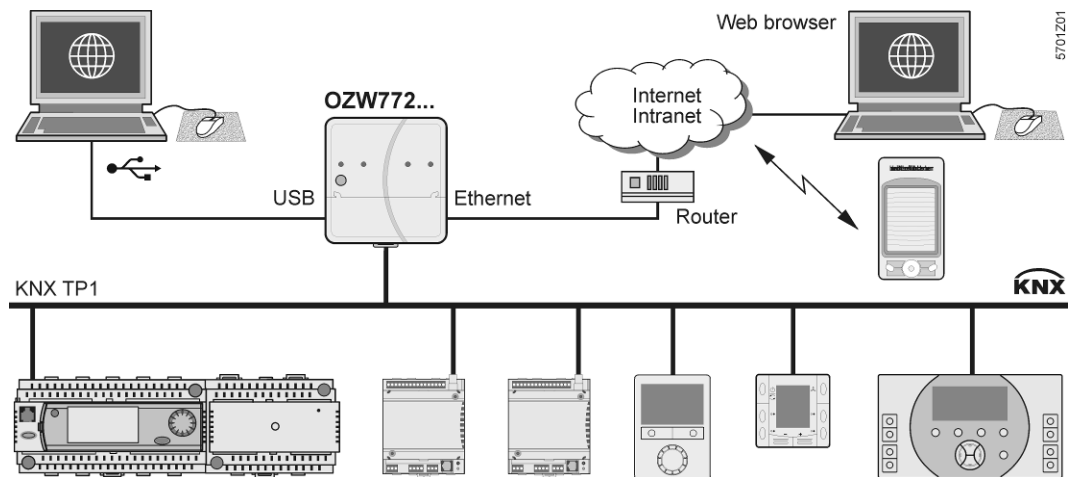
ACS provides standard plant diagrams for RDG KNX thermostats, which depend on the configuration as follows:

Plant type	Application Configuration	Application Configuration
2-pipe	2-pipe fan coil unit – Control sequence: No impact (P01 = any) – Fan operation: Not disabled (P52 <> 0) 	Radiator – Control sequence: Heating only (P01 = 0) – Fan operation: Disabled (P52 = 0) 
	Chilled / heated ceiling – Control sequence: Changeover (P01 = 2,3) – Fan operation: Disabled (P52 = 0) 	Chilled ceiling – Control sequence: Cooling only (P01 = 1) – Fan operation: Disabled (P52 = 0) 

Plant type	Application Configuration	Application Configuration
2-pipe and electric heater	2-pipe fan coil unit with electric heater – Control sequence: No impact (P01 = any) – Fan operation: Not disabled (P52 <> 0) 	Single stage with electric heater – Control sequence: No impact (P01 = any) – Fan operation: Disabled (P52 = 0) 
2-pipe and radiator	2-pipe fan coil unit with radiator – Control sequence: No impact (P01 = any) – Fan operation: Not disabled (P52 <> 0) 	Single stage with radiator – Control sequence: No impact (P01 = any) – Fan operation: Disabled (P52 = 0) 
4-pipe	4-pipe fan coil unit – Control sequence: Not auto c/o (P01 <> 3) – Fan operation: Not disabled (P52 <> 0) 	Chilled ceiling with radiator – Control sequence: No impact (P01 = any) – Fan operation: Disabled (P52 = 0) 
	Fan coil unit main / secondary – Control sequence: Auto c/o (P01 = 3) – Fan operation: Not disabled (P52 <> 0) 	Main / secondary – Control sequence: Auto c/o (P01 = 3) – Fan operation: Disabled (P52 = 0) 
2-stage heating or cooling	2-stage fan coil unit – Control sequence: No impact (P01 = any) – Fan operation: Not disabled (P52 <> 0) 	2-stage – Control sequence: No impact (P01 = any) – Fan operation: Disabled (P52 = 0) 

Plant type	Application Configuration	Application Configuration
4-pipe with el heater	4-pipe fan coil unit with electric heater - Control sequence: Not auto c/o ($P01 <> 3$) - Fan operation: Not disabled ($P52 <> 0$) 	1 stage Heat and Cool with electric heater - Control sequence: No impact ($P01 <> 3$) - Fan operation: Disabled ($P52 = 0$) 
	Fan coil unit main / secondary with electric heater - Control sequence: Auto c/o ($P01 = 3$) - Fan operation: Not disabled ($P52 <> 0$) 	Main / secondary with el heater - Control sequence: Auto c/o ($P01 = 3$) - Fan operation: Disabled ($P52 = 0$) 

5.2.3 Operation and monitoring with OZW772



**HomeControl app
for plant control**

The OZW772 web server enables users to operate a Synco HVAC system from a remote location – via PC or from a smart phone using the HomeControl app. A start page shows the most important data points. A combination of menu / path navigation enables users to access all data points quickly and straightforwardly. The entire installation can be visualized in the form of plant diagrams. Alarm and state messages can be forwarded to different message receivers, such as e-mail, SMS, etc.

For details, see Commissioning Instructions CE1C5701.

5.2.4 Operation and monitoring with RMZ792



The RMZ792 is a communicating operator unit designed for operating Synco™ 700 and RDG KNX devices in a KNX network. The operator unit is suited both for fixed installation and mobile use (e.g. for use by the service engineer). Third-party devices cannot be operated with it.

For details, see Basic Documentation CE1P3113.

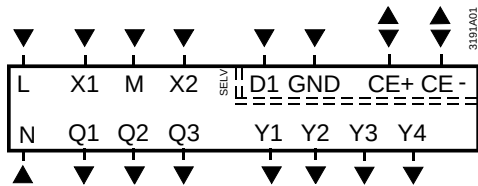
Note: The application cannot be displayed in the form of text, instead a number is used: (Parameter **Plant type** on menu **Basic setting**):

- 0 = no application
- 1 = 2-pipe
- 2 = 2-pipe and electric heater
- 3 = 2-pipe and radiator
- 4 = 4-pipe
- 5 = 2-stage
- 6 = 4-pipe and electric heater

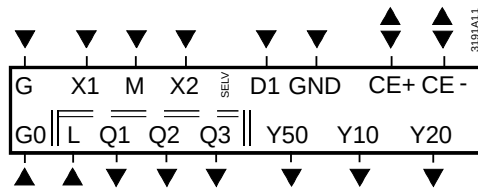
6. Connection

6.1 Connection terminals

RDG100KN



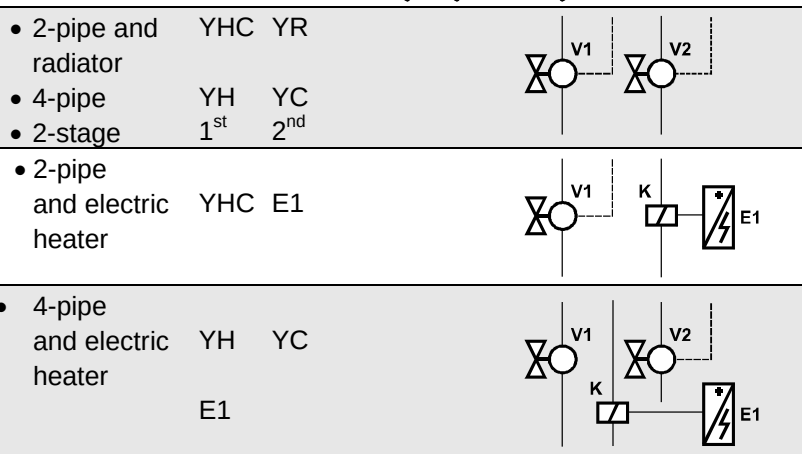
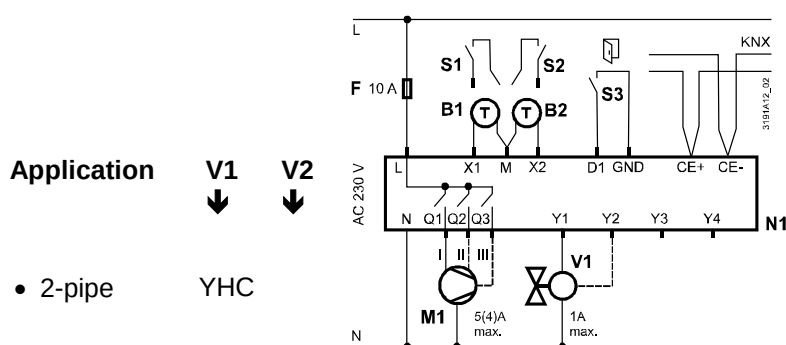
RDG160KN



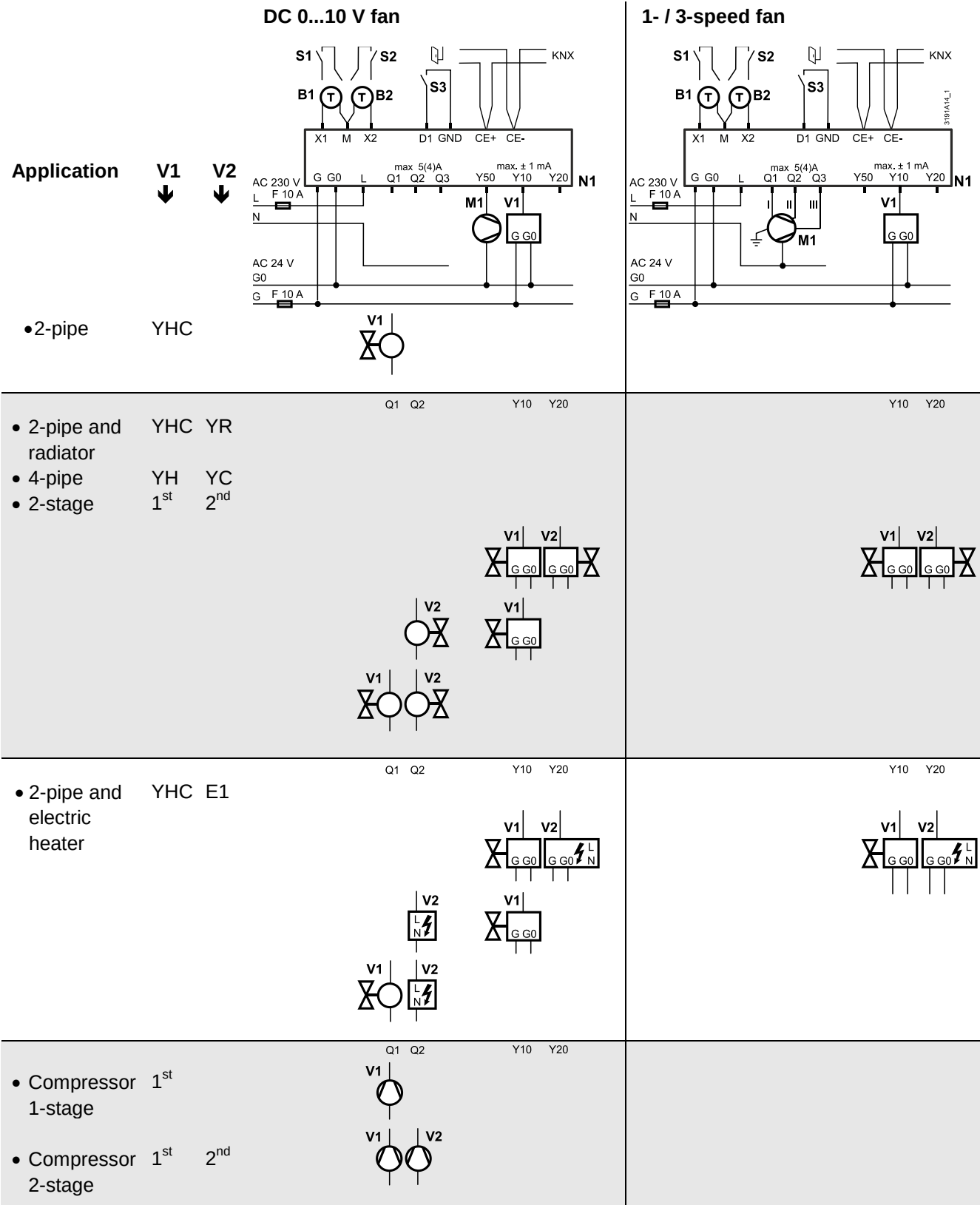
L, N	Operating voltage AC 230 V	(RDG100KN)
G, G0	Operating voltage AC 24 V	(RDG160KN)
L	Feed for relays AC 24...230 V	(RDG160KN)
X1, X2	Multifunctional input for temperature sensor (e.g. QAH11.1) or potential-free switch Factory setting: – X1 = External temperature sensor – X2 = No function (function can be selected via parameters P38 / P40).	
M	Measuring neutral for sensors and switches	
D1, GND	Multifunctional input for potential-free switch Factory setting: Operating mode switchover contact (function can be selected via parameter P42).	
Q1	Control output fan speed "low" AC 230 V	
Q2	Control output fan speed "medium" AC 230 V	
Q3	Control output fan speed "high" AC 230 V	
Q1...Q3	Also for special functions AC 24...230 V (RDG160KN)	
Y1...Y4	Control outputs "Valve" AC 230 V (RDG100KN) ("N/O" triac, for normally closed valves), output for electric heater via external relay	
Y10, Y20	Control outputs "Valve" DC 0...10 V	(RDG160KN)
Y50	Control output "Fan" DC 0...10 V	(RDG160KN)
CE+	KNX data +	
CE-	KNX data –	

6.2 Connection diagrams

RDG100KN



N1	Room thermostat RDG100KN	M1	1- or 3-speed fan
F	External circuit breaker	V1, V2	Valve actuators:
S1, S2	Switch (keycard, window contact, presence detector, etc.)		On/Off or PWM, 3-position, heating, cooling, radiator, heating / cooling,
S3	Switch at SELV input (keycard, window contact)		1st or 2nd stage
B1, B2	Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)	E1	Electric heater
CE+	KNX data +	K	Relay
CE-	KNX data -	YH	Heating valve actuator
		YC	Cooling valve actuator
		YHC	Heating / cooling valve actuator
		YR	Radiator valve actuator
		E1	Electric heater with relay / contactor
		1 st / 2 nd	1 st / 2 nd stage



N1	Room thermostat RDG160KN	M1	1- or 3-speed fan, DC 0...10 V fan
F	External circuit breaker	V1, V2	Valve actuators:
S1...S3	Switch (keycard, window contact, presence detector, etc.)		On/Off or DC 0...10 V, heating, cooling, radiator, heating / cooling, 1st or 2nd stage
B1, B2	Temperature sensor (return air temperature, external room temperature, changeover sensor, etc.)	YH	Heating valve actuator
CE+	KNX data +	YC	Cooling valve actuator
CE–	KNX data –	YHC	Heating / cooling valve actuator
		YR	Radiator valve actuator
		1 st / 2 nd	1 st / 2 nd stage

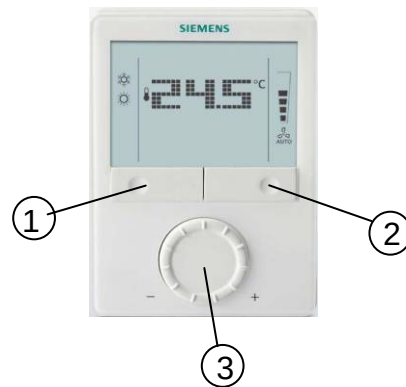
7. Mechanical design

7.1 General

The room thermostat consists of 2 parts:

- Plastic housing with electronics, operating elements and room temperature sensor
- Mounting plate with the screw terminals

The housing engages in the mounting plate and is secured with 2 screws.

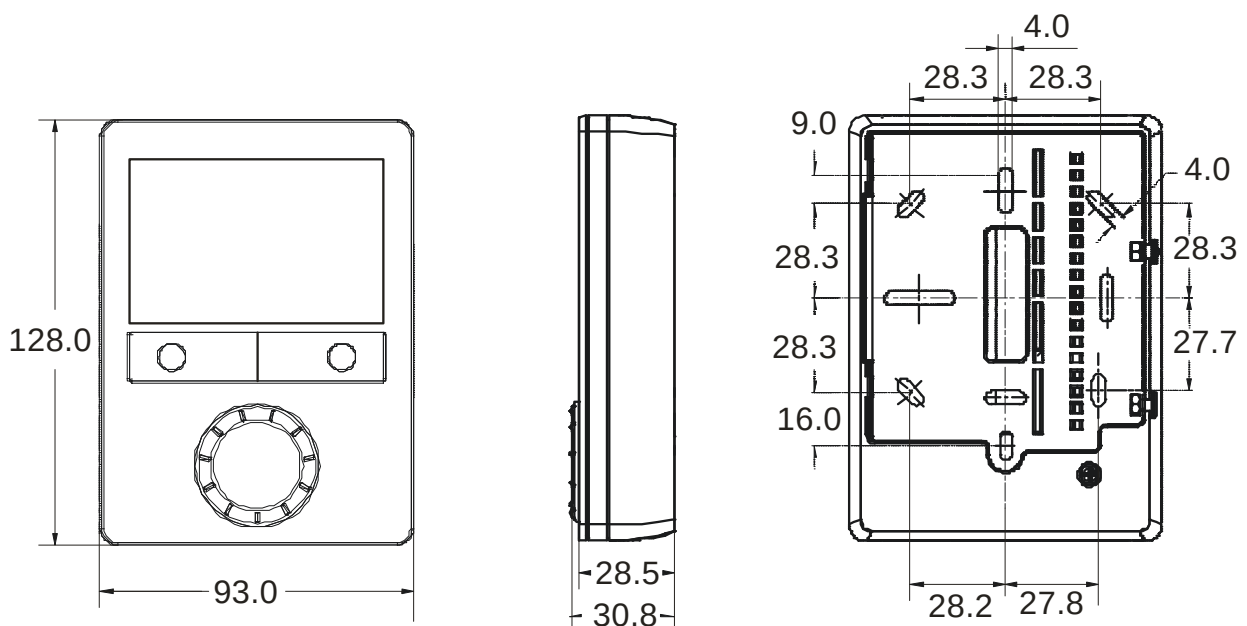


1. Operating mode selector / Esc
2. Fan mode selector / Ok
3. Rotary knob to adjust setpoints and parameters

For operation, refer to section 4.3.

7.2 Dimensions

Dimensions in mm



8. Technical data

RDG100KN

 Power supply

Rated voltage AC 230 V
Frequency 50/60 Hz
Power consumption Max. 8 VA / 1 W

Caution 

No internal fuse
External preliminary protection with max. C 10 A circuit breaker required in all cases

Outputs

Fan control Q1, Q2, Q3 – N AC 230 V,
Rating min, max resistive (inductive) 5 mA...5(4) A

Caution 

No internal fuse
External preliminary protection with max. C 10 A circuit breaker in the supply line required under all circumstances

 Note!

Fans must NOT be connected in parallel!

Connect one fan directly, for additional fans, one relay for each speed.

Control outputs	Solid state (Triac)
Y1, Y2, Y3, Y4-N	AC 230 V, 8mA...1 A
Power limitation	3 A fast microfuse, cannot be exchanged

Inputs

Multifunctional inputs

X1-M / X2-M

Temperature sensor input

Type	QAH11.1 (NTC)
Temperature range	0...49 °C
Cable length	Max. 80 m

Digital input

Operating action	Selectable (NO/NC)
Contact sensing	DC 0...5 V, max. 5 mA
Parallel connection of several thermostats for one switch	Max. 20 thermostats per switch. Do not mix with D1!
Insulation against mains	N/A, mains potential 

D1-GND

Operating action	Selectable (NO/NC)
Contact sensing	SELV DC 6...15 V, 3...6 mA
Parallel connection of several thermostats for one switch	Max. 20 thermostats per switch. Do not mix with X1 / X2!
Insulation against mains	3.75 kV, reinforced insulation

Function of inputs

External temperature sensor, heating/cooling	Selectable X1: P38
changeover sensor, operating mode switchover	X2: P40
contact, dewpoint monitor contact, enable electric heater contact, fault contact, monitoring input	D1: P42

RDG160KN

 Power supply

Rated voltage	AC 24 V
DC 24 V : Make sure to connect G to + and G0 to -	DC 24 V
Frequency	50/60 Hz
Power consumption	Max. 2 VA / 2 W

Caution 

No internal fuse
External preliminary protection with max. C 10 A circuit breaker
required in all cases

Outputs

Q1 / Q2 / Q3 / L - N (relay)	AC 24...230 V
Use for 3-speed fan control	

 Note!

Rating min, max resistive (inductive)	5 mA...5(4) A
Fans must NOT be connected in parallel!	
Connect one fan directly, for additional fans, one relay for each speed.	
Use for actuator control (Q1, Q2)	
Q1 - rating min, max resistive / inductive	5 mA...1 A
Q2 - rating min, max resistive (inductive)	5 mA...5(4) A
Use for external equipment (Q3)	
Rating min, max resistive / inductive Qx	5 mA...1A

Caution 

No internal fuse
External preliminary protection with max. C 10 A circuit breaker in the supply line
required under all circumstances

Inputs

ECM fan control	Y50 – G0	SELV DC 0...10 V, Max. ±5 mA
Actuator control	Y10 - G0 / Y20 - G0 (G)	SELV DC 0...10 V, Max. ±1 mA
Multifunctional inputs		SELV
X1-M / X2-M		
Temperature sensor input		
Type		QAH11.1 (NTC)
Temperature range		0...49 °C
Cable length		Max. 80 m
Digital input		
Operating action		Selectable (NO/NC)
Contact sensing		DC 0...5 V, max. 5 mA
Parallel connection of several thermostats for one switch		Max. 20 thermostats per switch
D1-GND		
Operating action		Selectable (NO/NC)
Contact sensing		DC 6...15 V, 3...6 mA
Parallel connection of several thermostats for one switch		Max. 20 thermostats per switch
Function of inputs		Selectable
External room temperature sensor, heating/cooling changeover sensor, operating mode switchover		X1: P38
contact, dewpoint monitor contact, enable electric heater contact, fault contact, monitoring input, supply air temperature		X2: P40
		D1: P42

RDG100KN, RDG160KN

KNX bus	Interface type	KNX, TP1-64 (electrically isolated)
	Bus current	20 mA
Operational data	Bus topology: See KNX Manual (see 1.2 "Reference documents")	
	Switching differential (adjustable)	
	Heating mode	(P30) 2 K (0.5...6 K)
	Cooling mode	(P31) 1 K (0.5...6 K)
	Setpoint setting and setpoint range	
	 Comfort	(P08) 21 °C (5...40 °C)
	 Economy	(P11-P12) 15 °C/30 °C (OFF, 5...40 °C)
	 Protection	(P65-P66) 8 °C/OFF (OFF, 5...40 °C)
	Multifunctional inputs X1 / X2 / D1	
	Input X1 default value	(P38) 1 (ext. temperature sensor, room or return air)
Environmental conditions	Input X2 default value	(P40) 0 (no function)
	Input D1 default value	(P42) 3 (operating mode switchover)
	Built-in room temperature sensor	
	Measuring range	0...49 °C
	Accuracy at 25 °C (after calibration via P05)	< ± 0.5 K
	Temperature calibration range	± 3.0 K
	Settings and display resolution	
	Setpoints	0.5 °C
	Current temperature value displayed	0.5 °C
	Operation	
Standards and directives	Climatic conditions	IEC 721-3-3
	Temperature	Class 3K5
	Humidity	0...50 °C
	Transport	
	Climatic conditions	<95% r.h.
	Temperature	IEC 721-3-2
	Humidity	Class 2K3
	Mechanical conditions	-25...65 °C
	Storage	
	Climatic conditions	<95% r.h.
Standards and directives	Temperature	IEC 721-3-1
	Humidity	Class 1K3
	EU conformity (CE)	
	Product standards	
	Automatic electric controls for household and similar use	EN60730-1
	Special requirements for temperature-dependent controls	EN60730-2-9
	Electronic control type	2.B (micro-disconnection on operation)
	Electromagnetic compatibility	
	Emissions	2004/108/EC
	Immunity	EN60730-1, EN50491-5-2
Standards and directives	Low-voltage directive	
	Electrical safety	EN60730-1, EN50491-3
	 RCM Mark conformity (Emission)	EN50491-5-3

Environmental Compatibility

eu.bac



General

Caution



Reduction of hazardous substances

2011/65/EU

EN50581

Safety class

II as per EN60730

Pollution class

Normal

Degree of protection of housing

IP30 as per EN60529

The product environmental declaration CE1E3181^{*)} contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).

Meets the requirements for eu.bac certification

See product list at: <http://www.eubaccert.eu/licences-by-criteria.asp>

RDG160KN (License 213356)

Energy Efficiency Label

Control accuracy [K]

Fancoil unit systems (2 pipes 2 wires)
(Motorised actuator DC, variable fan speed)

AA

Heating 0.1
Cooling 0.1

Fancoil unit systems (4 pipes)
(Thermal actuator 2-pt, variable fan speed)

A

Heating 0.4
Cooling 0.4

Connection terminals

Solid wires or stranded wires
with ferrules
1 x 0.4...2.5 mm²
or 2 x 0.4...1.5 mm²

Minimal wiring cross section on
L, N, Q1, Q2, Q3, Y1, Y2, Y3, Y4

min 1.5 mm²

Housing front color

RAL 9003 white

Weight without / with packaging

RDG100KN 0.270 kg / 0.380 kg

RDG160KN 0.240 kg / 0.320 kg

*) The documents can be downloaded from <http://siemens.com/bt/download>.

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